SOUTHAMPTON OCEANOGRAPHY CENTRE

CRUISE REPORT No. 58

RV *POSEIDON* CRUISE 314
11 JUL - 23 JUL 2004

The 'Extended Ellett Line'
Scotland – Rockall – Iceland time series

Principal Scientist
J F Read

2005

George Deacon Division for Ocean Processes
Southampton Oceanography Centre
University of Southampton
Waterfront Campus
European Way
Southampton
Hants SO14 3ZH
UK

Tel: +44 (0)23 8059 6432
Fax: +44 (0)23 8059 6234
Email: J.Read@noc.soton.ac.uk

DOCUMENT DATA SHEET

AUTHOR

READ, J F et al

PUBLICATION DATE

2005

TITLE

RV *Poseidon* Cruise 314, 11 Jul – 23 Jul 2004. The 'Extended Ellett Line', Scotland – Rockall – Iceland time series.

REFERENCE

Southampton Oceanography Centre Cruise Report, No. 58, 68pp.

ABSTRACT

This report describes R/V *Poseidon* Cruise 314, designed to repeat the hydrographic section from Scotland to Rockall, called the Ellett Line, and its extension to Iceland.

73 stations were worked with CTD and lowered ADCP and sampled for chemical (macro-nutrients and dissolved oxygen) and biological (chlorophyll a) analyses. Additional samples for analysis of dissolved iron, pigments and plankton physiology were taken at a few selected sites. Underway measurements of depth, meteorology, surface water properties and currents were made. The weather during the cruise was good, with no time lost to the elements and more than the expected number of stations worked. Conversely data logging and processing suffered from so many problems that it was not possible to edit and calibrate the data during the cruise.

KEYWORDS

ADCP, ATLN, chlorophyll, Cruise 314 2004, CTD observations, FRRF, Iceland Basin, dissolved iron, LADCP, North Atlantic, nutrients, oxygen, *Poseidon*, repeat hydrography, Rockall Trough, salinity, VM-ADCP

ISSUING ORGANISATION

Southampton Oceanography Centre
Empress Dock
European Way
Southampton SO14 3ZH UK

Copies of this report are available from: **National Oceanographic Library, NOCS** *PRICE*:
Tel: +44(0)23 80596116 Email: nol@noc.soton.ac.uk

CONTENTS PAGE

TABLES

APPENDICES

PERSONNEL

Scientific Personnel

READ, Jane	Principal Scientist	SOC
ALLEN, John		UHI-ERI
BENSON, Jeff		SOC (UKORS)
BRISTOW, Laura		SOC
CORBEL, Gwenna		UHI-ERI
FONES, Gary		SOC
HENSON, Stephanie		SOC
HOLETON, Claire		SOC
JONES, Gwyneth		SOC (ITG)
LESTER, Adrian		SOC

Ships Personnel

SCHNEIDER, Michael	Captain
GÜNTHER, Matthias	Chief Mate
LIEBERT, Thomas	2nd Officer
DOHMANN, Frank Werner	Chief Engineer
HAGEDORN, Günther	Second Engineer
KLARE, Werner Dietmar	Electrician
MISCHKER, Joachim	Bosun
KRÖGER, Kurre Klaas	S/M 1
SCHRAGE, Frank	S/M 2
BARBOSA, Pedro Manuel	A/B 1
COSTA MARCALO, Fernando	A/B 2
HERM, Theodor	Motorman
HOORMANN, Werner	Cook
THURAU, Axel	Steward
WICHMANN, Gent	Cadet

CRUISE OVERVIEW

Objectives

RV *Poseidon* cruise 314 set out to occupy the "Extended Ellett Line" Scotland – Rockall – Iceland time series. The objectives of doing so were:

1. To observe water mass properties, the instantaneous velocity field and subsequently the heat and salt (freshwater) fluxes between the subpolar gyre and the Nordic Seas in 2004.

2. To compare the 2004 conditions with those observed in the previous years (to 1975 in Rockall Trough, 1988 in the Iceland Basin), quantifying the interannual to decadal changes in properties and understanding the causal mechanisms of variability.

3. To enhance the physical and tracer measurements with biological observations to investigate nutrient cycling, export production, ecosystem structure and dynamics.

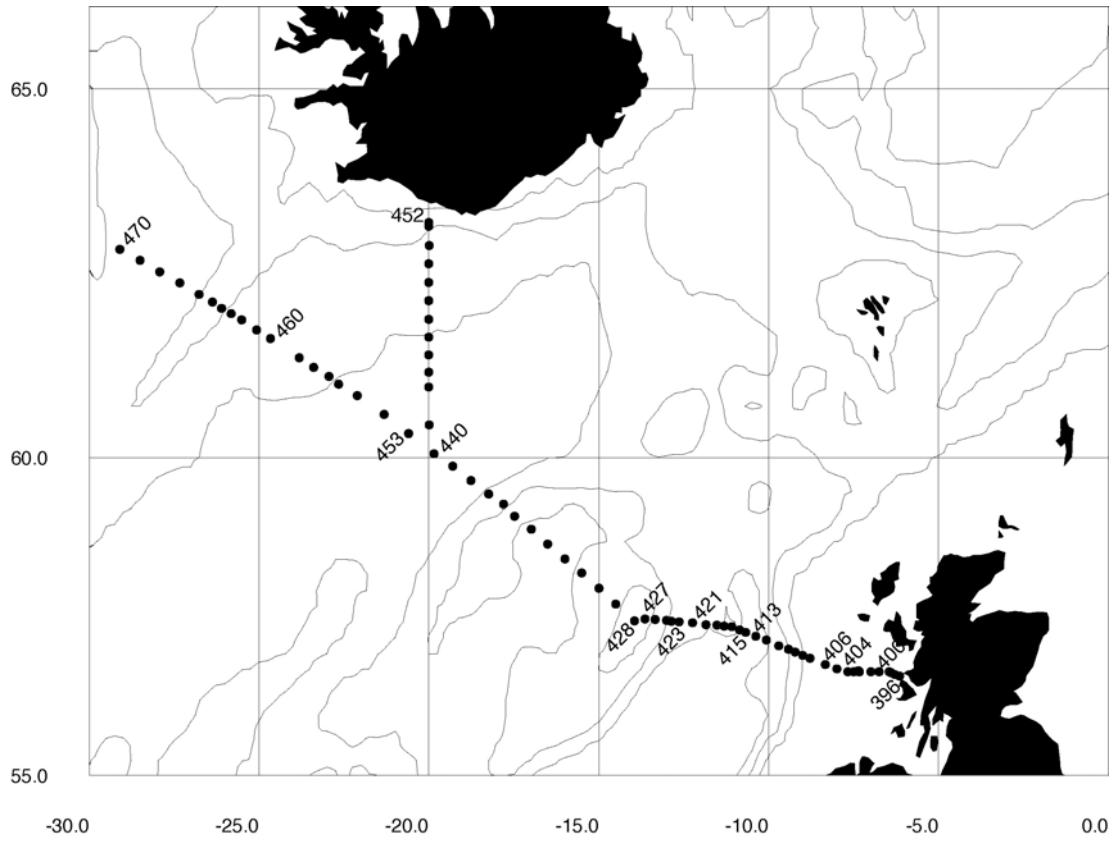


Figure 1. CTD station positions occupied during *RV Poseidon* cruise 314, 11-23 July 2004.

Overview

The cruise went remarkably well. All the planned stations were occupied with additional stations worked during the last two days. This was possible because of the unusually calm weather. For the second half of the cruise settled high pressure over the Irminger Basin deflected the jet stream and associated low pressure depressions southwards, away from the working area. No time was lost to bad weather.

Problems during the first day or so of the cruise were soon solved. The CTD winch arrangement on RV *Poseidon* has very narrow access for the CTD frame. Since we expected adverse weather a small, 12 bottle CTD frame that could carry the lowered ADCP was requested from IFM Kiel. This was not provided and on arrival at the ship it was found that the new 300 kHz upward/downward looking lowered ADCP, just delivered, could not be fitted to the small frame, only the larger, 24 bottle CTD frame.

Therefore it was decided to use the large frame, but on the first deployment, no signal could be obtained from the CTD pressure sensor. After several attempts to get it working, the wire was swapped to the small frame. This was without the lowered ADCP and the oxygen sensor was U/S. The station was sited in the Sound of Mull. The channel is narrow with strong tidal currents and several fishing boats were working in the area. Therefore the ship had to keep steaming down the channel and into more open water away from the station where it was safer to heave to. The officers brought the ship back on station each time requested. It took a total of 7 hours to get a CTD system up and running and to work the station.

The first 7 stations (396-402) were worked with only pressure, temperature and conductivity. Before station 403 the Beckman oxygen sensor was replaced with an SBE sensor and before station 404 the fluorimeter was added. During this time the ship was in relatively sheltered and shallow water, working across the continental shelf. But there was considerable discussion on what to do about the lowered ADCP and what alternatives were available. The lowered ADCP was particularly wanted on the continental slope to measure any slope current that might be present.

Before reaching the shelf edge the engineers were able to rig the lowered ADCP to the small CTD frame and make a guard for it. The work took 2-3 hours and was done underway so very little time was lost. The move proved timely since the weather deteriorated over the next day or two with wind speeds up to 20 knots and heavy seas. Using the 24 bottle frame would have been impossible in such conditions. As it was, the only delay experienced was remaining on station to sample the bottles. With the wind on the port quarter during steaming, considerable quantities of water were shipped along the working area of deck.

The bad weather was left behind at Rockall and the rest of the Extended Ellett Line was completed very efficiently, with Iceland reached in the early hours of Monday 19 July. The vessel returned to 60°N, 20°W and worked CTD stations along TOPEX/Poseidon track 146 across the Iceland Basin and Reykjanes Ridge and into the Irminger Basin. Work finished at 0800 on Thursday 22 July.

Unfortunately data logging and processing did not go as smoothly as the data collection.

The network proved unreliable in that only one of the computers could see all of the network. The others could only see some of it some of the time. Decoding the navigation and underway data was not completed. One minute data were available for the ships track and station positions, but not the real-time (high resolution) NMEA sentences. The vessel-mounted ADCP was also unreliable either re-starting itself or hanging for no obvious reason. Although the data were read in no further processing was possible without the high resolution NMEA data. It took a week to determine the CTD processing path and although the data were ready to calibrate, the oxygen and the last nutrient and salinity samples were not available until the last day of the cruise. Problems with the navigation, vessel mounted ADCP and CTD processing meant that the lowered ADCP could not be processed. It was felt that in the future priority should

be given to writing a programme that accesses the lowered ADCP binary files to provide a plot against time as a check to ensure that the instrument is working.

Discrete sample analysis was not without problems. Both nutrient and oxygen pc's caused considerable difficulties, although they did not prevent sample analysis being completed. Pole sampling proved difficult but not impossible, but fewer samples were collected than planned. It was not appreciated until late in the cruise that no PAR data were available to aid interpretation of pigment and FRRF samples.

Summary

RV *Poseidon* cruise 314 "The Extended Ellett Line 2004".

11 July – 23 July 2004 King George V Dock, Govan, Glasgow – Reykjavik, Iceland

Approximately 1600 nautical miles (3140 km) were steamed.

73 CTD stations were worked (Fig. 1 and Appendix 1), 59 with lowered ADCP.

331 salinity samples, 629 oxygen samples and 722 macro-nutrient samples were drawn (Fig. 2) and analysed.

About 106 chlorophyll a samples, 9 HPLC samples and 13 iron samples were drawn (Table 1) and preserved for analysis after the cruise.

2 Apex floats were deployed.

Continuous underway measurements were made of surface currents (Appendix 2), meteorological and surface data (Fig. 3).

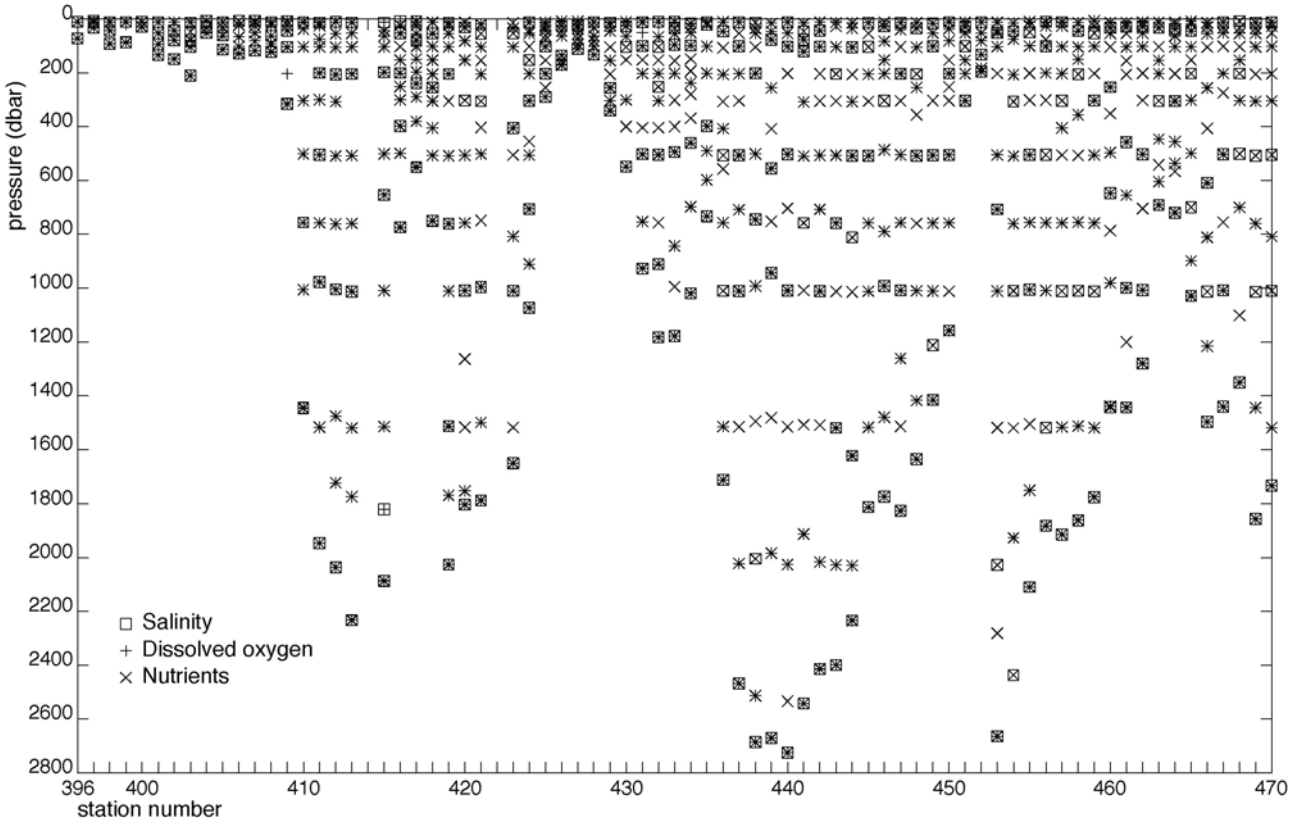


Figure 2. CTD bottle sample depths.

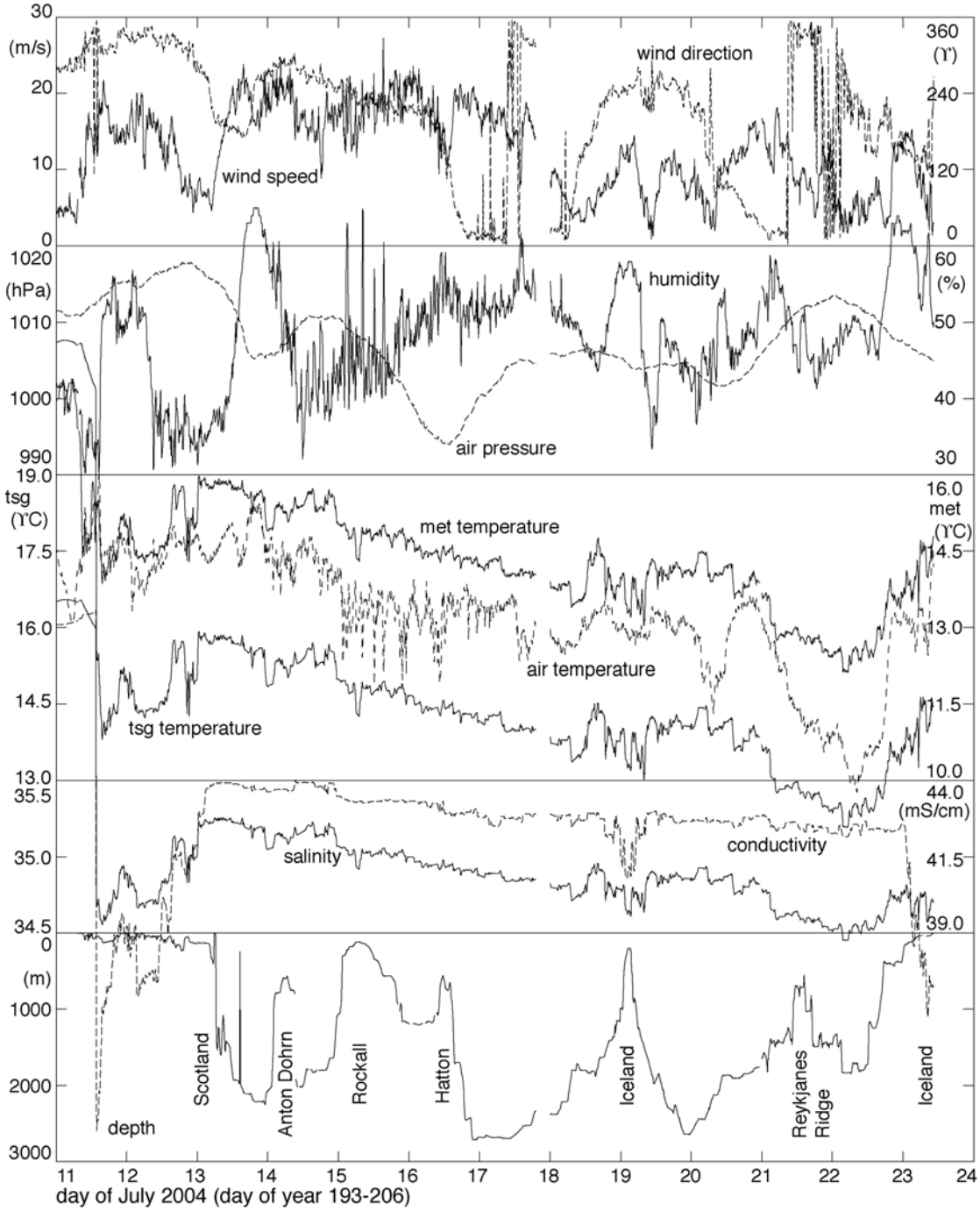


Figure 3. Underway meteorological (met), surface (tsg) and bathymetry measurements

Cruise Diary

Sunday 11 July 2004

Sailed promptly, 0830 (all times in this diary local ship time, BST), from King George V Dock, Glasgow, and down the Clyde. Beautiful morning, sunny, high clouds, gentle breeze from the west (about 5 m/s). Under Erskine Bridge, past Dumbarton Rock and out into the Firth of Clyde. Rounded the Mull of Kintyre so out into the North Channel and past the Inner Hebrides heading for the first station in the Sound of Mull

John and Adrian working to resolve NMEA input. Managed to stream data via hyper terminal on an old powerbook running MacOS 9. Duplicating and downloading to a MacOSX ibook, from which it can be ftp'd to unix. Oxygen pc playing up, yesterday it was the nutrients pc.

Lumpy overnight. Some short on sleep and one case of sea sickness. More sheltered once into the Sound of Mull.

Monday 12 July 2004

Arrived first station, ctd 396, 0400. Since we have 9 shallow shelf stations opted to use this as a test station. Not a good choice since position in 40 m of water next to a hole of about 190 m. Surrounded by fishing vessels and buoys, windy and strong tidal currents. Ship intercom not working. CTD pressure sensor not working. Made two attempts to deploy. Tried to raise IFM, got through to Thomas Muller who sent new calibration info but to no effect. Switched to second CTD on small frame without LADCP. Oxygen sensor not working but worked the station anyway.

Had to give Jeff a break so worked stations 397-402 without oxygen or LADCP. Additional station worked about 2 miles short of station 4G. Station positions still on the bridge chart from Colin Griffiths cruise last year, so assume our additional station (ctd 398) to be 3G, which we intended to omit. New oxygen sensor added for station 403. Fluorimeter added for station 404. Stations 405 and 406 also completed.

Tuesday 13 July 2004

Stations 407-409 completed overnight. Station 409 (Q) on the shelf edge. Station 410 (P) the first in the deeper water down the continental slope where we need LADCP (to measure any slope current). Between station 409 and 410 the ships engineers built a mount for the LADCP on the small CTD frame. Engineers most efficient and ready to go by late coffee time, with minimal time spent hove to waiting. First pole sample (for iron, FRRF and HPLC) taken as coming on station. Some fine-tuning of the method needed, since the 5 m long pole, with 1 litre of water at the far end, very unwieldy. Also introducing the sample to the FRRF causing problems and the method needs adapting. Station 410 completed with LADCP and work continued into the deep water of Rockall Trough. Stations 411-413 completed. The first Argos float deployed at the end of station 413 (M) and called station 414.

Wednesday 14 July 2004

Stations 415-421 completed across the Anton Dohrn seamount with second pole sample before 419. Second Argos float deployed after ctd421 (F), station 422. It was released with the sensor caps on. During attempt to recover it, the upright float disappeared in front of the First Mate, the crew and PS. It was last seen positioned about 10 m off the port bow with 2 fulmars next to it. The ship was backed away gently but after an hours search there was no sign of it and it was presumed to have dived/sunk well ahead of schedule. Station 423 completed with pole sample.

Thursday 15 July 2004

Stations 424-426 were completed overnight with pole sample at 426. Station 427 was worked off Rockall (station A) thus completing the 2004 occupation of the Ellett Line. Work continued on the Extension to the Ellett Line with stations 428-431 completed. Minor changes made to watch keepers to facilitate biological sampling.

Friday 16 July 2004

Stations 432-437 completed. True deep water reached in the Iceland Basin. Weather improving. All forms for docking in Iceland completed prior to entering Icelandic waters and fulfilling the new ISPS regulations. Clarification needed for chemicals remaining after a cruise and disposal of water products. IMO numbers, classifications and forms needed.

Saturday 17 July 2004

Weather greatly improved, seas gentler and wind decreased, cold with occasional rain. Stations 438- 442 completed. Pole samples collected after stations 438 and 442.

Safety drill set for 1020 but delayed because of station work. New time of 1520 meant that CTD work had to be delayed so that the Mate could sleep in the afternoon. About an hour lost. Mustered on deck, quizzed on procedures and lifeboats, liferafts and survival suits demonstrated. Video on liferaft handling shown in the Officers mess.

PC-Log hung taking with it the NMEA data output. Lost about 2 hours of data. Instigated hourly checks on ADCP, PC-Log and NMEA logging computer.

Sunday 18 July 2004

Beautiful day, calm seas with little wind, only a slight swell to remind us we're on a ship. Completed stations 443 - 450 with pole sample collected after 443.

Lots of biology today. Swarms of salps appeared at the surface overnight. Minor fouling event of the oxygen sensor on ctd 444. Major fouling on ctd 445 when both oxygen and conductivity fouled at about 1750m and didn't clear until 750m. Sensors cleaned with soap solution followed by weak hydrochloric acid. Pilot whales spotted during ctd 446, small pods of 5-8 individuals and one larger group as we left the station. Birds seen included fulmar and kittiwakes, a great skua and puffins.

Increasing problems with the ADCP. Not sure where the problem is but its proving necessary to restart the pc frequently. The ashtech ADU2 also needs restarting. About 20:00 the ADCP pc could not connect with the profiler. Switching off deck unit and pc together seemed to clear the problem.

Monday 19 July 2004

Completed the Extended Ellett line at 3am with stations 451 and 452, about 3 hours ahead of schedule. Pole sample after 451. Vestmannjaer and the other islands silhouettes in a rather gloomy sky. Turned south to join the satellite track (T/P146) west of 20°W. Left Iceland wrapped in cloud with the glacier peeping out in a very red sunrise.

Weather continued good, calm but increased winds and colder. Fire drill at 1020. Scientists mustered then waited on the after deck while the officers and crew dealt with the fire.

The passage leg used for some general cleaning and tidying, and for data processing and cruise report writing. Data beginning to come through. John batch processing SBE (again) to generate the correct file structure for sam0. Meanwhile Stephanie pressing on with CTD processing. Gwenna extracting ADCP data from pingdata files. Laura helping Gary sort nutrients but Claire struggling with oxygen processing.

On station for the satellite extension at about 21:00, completed CTD 453 followed by a pole sample.

Tuesday 20 July 2004

Completed stations 454-459 with pole samples after 456, 457, 458 and 459. Weather continuing remarkably calm, windy but no swell. Chilly and grey in morning, sunny in afternoon. Station 456 delayed for lunch. An extra station added, 458, to slow down our passage, postponing the end of station 459 until midnight for pole sampling. Since we are making such good time, eight stations were added to the end of the line, across the Reykjanes Ridge and into the Irminger Basin.

Wednesday 21 July 2004

A grey, chilly, but calm day. Completed stations 460-467. Crossed the Reykjanes Ridge and into the Irminger Basin in the afternoon.

Thursday 22 July 2004

Completed CTD station 468 and the penultimate station, 469, at 06:00, the Masters deadline to head for Iceland, but we continued to the last station on the line at 29°W. Completed station 470 at 08:10 then turned for Reykjavik. RV *Poseidon* making over 9.5 Knots, well above her usual steaming speed. Speed reduced by late afternoon when it was clear we would have plenty of time to meet the pilot at 08:00 tomorrow. Much of the passage leg spent data processing, tidying, stripping down the instruments and packing. Last salinities and nutrients analysed by late evening. Weather continued abnormally calm.

Friday 23 July 2004

Ships clock back 1 hour overnight to go to Reykjavik local time (GMT). Making the approach to Reykjavik by 6am and stood by the entrance until the pilot arrived about 9:30. Computing system backed up, then stripped down and packed by midday. Other labs all cleared. The container arrived about 14:30 and crew craned the boxes ashore in the pouring rain.

Minor (major?) upset about disposal of autoanalyser waste. No contact from Institute of Marine Research so asked agent to arrange disposal. However, needed constitution of the waste and had to extract a pc from the packed container to obtain the information. Sorted eventually.

Saturday 24 July 2004

Final cleaning of cabins and laboratory space. Scientists disembarked after lunch.

INDIVIDUAL REPORTS

Computing - *Gwyneth Jones*

Ship's systems

The computing network on FS-*Poseidon* consisted of a 10/100 Mbit/sec passive Ethernet. Individual computer systems for each shipboard instrument were attached to the network (Figure 4). These were;
DOS 6.2 PC controlling the VM-ADCP,
DOS 6.2 PC-LOG recording all the underway instruments,
Windows 98 PC operating the CTD system and an
HP Laserjet 2300dtn printer.

All the ship's computer operating systems and printers were in German, which provided quite a challenge?

Data on the ship's VM-ADCP, PC-LOG and CTD computers were available by FTP and in addition the CTD computer could be accessed by Windows networking.

There was no Domain name Server (DNS) or Network Information Service (NIS) server on board.

The vessel had three types of power supply; power over USV (unbreakable power supply), stable power supply and normal power.

The ship's network structure was as follows;

Address range:	134.245.221.1 to 134.245.221.255
Subnet mask	255.255.255.0 / 255.255.248.0
DHCP	none
Gateway (router)	none
Name server (DNS)	none

IP address	**System**	**Location**
134.245.221.136	PC-Log computer	Dry lab
134.245.221.138	ADCP computer	Dry lab
134.245.221.147	CTD computer	Dry lab
134.245.221.237	HP 2300 Laser Jet Printer	Dry lab
134.245.221.230	Captain's computer	Captain's cabin
134.245.221.235	Bridge computer	Bridge

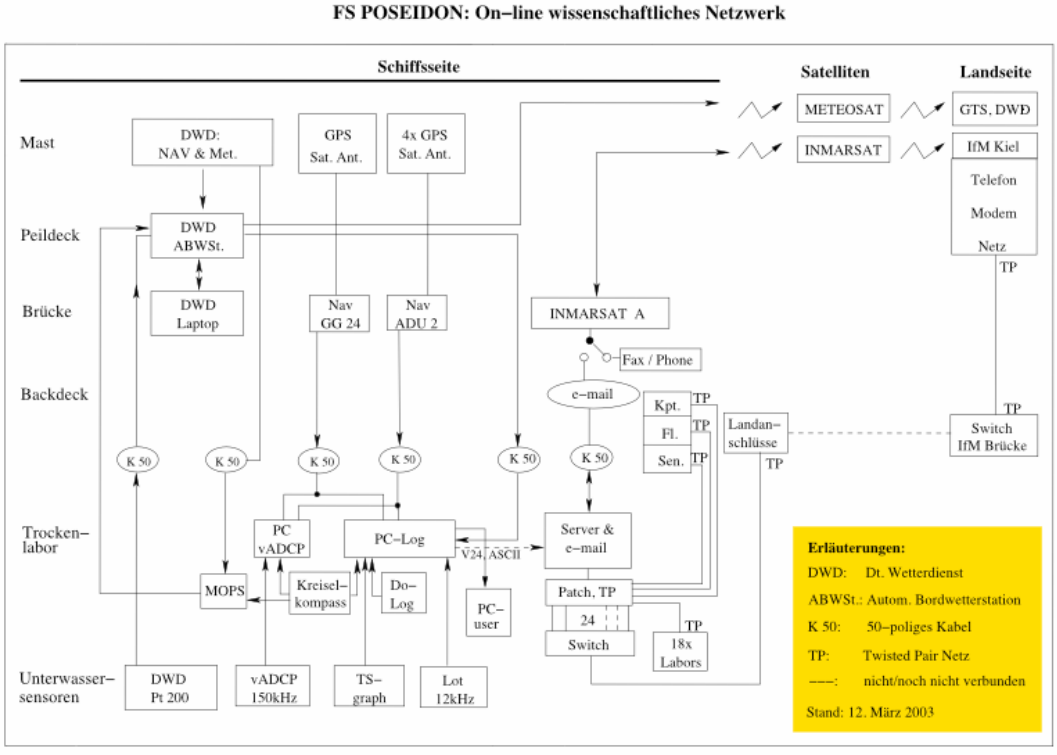


Figure 4. FS *Poseidon* On-line scientific network

SOC system

Computing equipment provided from SOC consisted of:

SUN Blade 1000 workstation “sohydro6” with two 18 Gb disks,
Sun Ultra 60 workstation “orthus” with one 9 Gb disk and one 18 Gb disk,
HP Business Inkjet 2300 colour printer,
three Apple Mac computers: G4, iBook andPowerbook G3,
three PC computers; Windows98 PC running the Seabird CTD Processing software, a WindowsXP PC running the RDI lowered ADCP logging software and a Windows 2000 laptop PC used for email, system management, backup and archiving.
In addition to these there were a number of personal Mac and PC laptops.

Software packages were installed on sohydro6 and consisted of Fortran, Uniras, Pexec, Matlab, NAG, Perl, Staroffice and Unix Utilities. User home directories were set up on sohydro6, as was a Samba server, which enabled file sharing from UNIX to the Macs and PCs on board. A DNS server was set up on the Apple iBook.

The SUN workstations were connected to the USV supply and the Macs, PCs and printer were connected to the stable power supply. The SOC systems were networked via two network hubs onto the ship’s network.

Email

Initially it had been hoped that a new email server running Linux would be available for use on the cruise, but there were problems connecting it to the server in Kiel via the ship's satellite during mobilisation, and the system was removed prior to sailing.

A "scientist's" shared email account was set up on the ship's email system, Skyfile by France Telecom, a Windows email program for Inmarsat-A, -B, -M, -Mini-M, -ISDN, -Fleet and Iridium. Access to this was made available via Windows networking to the bridge computer on a PC laptop in the Dry Lab. Although not an ideal setup, it did provide the necessary link back to base. Previous cruises had had to use the computer on the bridge to send email.

Backups and archiving

A daily incremental backup of the cruise data set was run on sohydro6 together with backups to firewire disk. Daily backups of the NMEA working files on the iBook were made to firewire disk.

The cruise data set was archived to two firewire disks as well as to the disks on the two UNIX workstations.

Problems

There were inconsistencies on the ship’s network. Some of the ship’s computers were set up with a subnet mask of 255.255.255.0, while others were on 255.255.248.0. The Principal Scientist was unable to see the ship’s network from her cabin with either subnet mask. Other problems were experienced with parts of the network appearing and disappearing for no apparent reason. The Windows 2000 laptop proved to be the most reliable computer, as it was always able to see and connect to all systems on both the scientific and ship's network without needing to change the subnet mask.

The two PCs used for running the autoanalyser and the Winkler titration system had a number of problems. Neither had network cards, so data had to be transferred by floppy disk but there was only one floppy disk drive available between the two machines. This was highly unsatisfactory and it was fortunate that no data were lost. Both PCs also tended to “hang” for no reason and the PC running the Winkler titration software continually interrupted the processing with warning messages. As

far as could be established the titration and data logging proceeded correctly despite the warnings.

Most software worked as expected, except for some software on the chemistry PCs, which was proprietary with no export of data available. The Pexec program" pinq" did not recognise the –U option as the version of the program that had been copied from the server at SOC was not the latest.

With the various equipment and network problems experienced, spare PCs would have been useful.

Acknowledgements

Very many thanks to Christopher Smarz for his help in explaining the computer set up during mobilisation.

Instrumentation – *Jeff Benson*

CTD System Operation

1) A total of 73 CTD casts were completed on the cruise, using a 12-way frame arrangement consisting of:

Sea-Bird 9/11+ CTD
Dr. Haardt fluorometer, chlorophyll a
RD Instruments Workhorse LADCP (upward & downward looking)
Sea-Bird 12 position Carousel
12 by 10L General Oceanics Niskin bottles

2) The configuration for the CTD was as follows, from cast 396 through cast 402 (Appendix 4ia):

Sea-Bird 9+ underwater unit, s/n 09P-25213-0615
Sea-Bird 3 Premium temperature sensor, s/n 03P-4051 (frequency=0)
Sea-Bird 4 conductivity sensor, s/n 04C-2537 (frequency=1)
Digiquartz temperature compensated pressure sensor, s/n 82991 (frequency=2)
Sea-Bird 13 Beckman dissolved oxygen sensor, s/n 13B-0555 (V0=oxygen temperature & V1=oxygen current)
Sea-Bird 5T submersible pump, s/n 05T-3021
Sea-Bird 12 position Carousel
Sea-Bird 11+ deck unit, s/n 11P-34783-0674
Sea-Bird Bottom Contact Switch

The configuration for cast 403 was as above, with the following substitution (Appendix 4ib):

Sea-Bird 13 Beckman dissolved oxygen sensor, s/n 13B-0555 replaced with
Sea-Bird 43 Oxygen sensor, s/n 43-0631 (V0)

The configuration for cast 404 through cast 409 was as cast 403, with the following addition (Appendix 4ic):

Dr. Haardt fluorometer, chlorophyll a, s/n 14010 (V2)

The configuration for cast 410 through cast 470 was as casts 404 through 409, with the following addition:

RD Instruments Workhorse Monitor 300 KHz, s/n 876 (downward-looking/master)

RD Instruments Workhorse Monitor 300 KHz, s/n 839 (upward-looking/slave)

Kiel battery pressure case, alkaline cells

Configuration files are listed as CONFIG1 and CONFIG2 (Appendix 4ii)

Miscellaneous

1) Salinometer----The Kiel Guildline Autosal, model 8400A, s/n 50378 was used throughout the trip. A total of 330 salinity samples were analysed, all from CTD casts. Although the salinometer was sited in a non-temperature controlled lab, readings were mostly stable and drift was reasonably constant. Cleaning of the conductivity cell was required prior to analysing samples at the beginning of the cruise, to eliminate trapped air and DI water that could not be removed via flushing of the cell.

2) RO and Milli-Q water systems----OED system serial number 001 was installed in the chemistry lab prior to sailing, and was operated without problems for the duration of the cruise. One chlorine cleaning cycle was performed, and one pre-filter used.

3) Fast Repetition Rate Fluorometer---Chelsea FRRF, s/n 182039 was installed in the geo lab as a surface mount for discrete samples only. Flow-through seawater was not used.

Continuous measurements

Ships instruments – Jane Read

RV *Poseidon's* underway instruments were logged together via an MS-DOS PC based package PC-LOG. Data were recorded into binary files on the PC and sent to a microprocessor, which made the data available via NMEA sentences. The ships instruments consisted of

GPS + GLONASS
ADU2 (3D-GPS)
gyrocompass
Doppler-log
echosounder
meteorological instruments
thermosalinograph

Two echosounders were in use, one in shallow seas, the other in deep water. No record was made of when the data stream was swapped between them. Both instruments were under the control of the bridge and the Master set up filters on the deep sea echosounder to reduce the spurious returns and loss of signal. The problem could not be cured completely and was especially noticeable during CTD stations when the signal was lost as the instrument package approached the seabed. As a result it was not possible to estimate the distance off the bottom on some stations.

The meteorological system was operated by DWD-Milos, the german weather bureau. Data from the system was transmitted to the DWD by satellite link and the instruments were maintained by the captain and officers.

Data could be obtained from the PC-LOG by interrupting the data logging and running the program XLOG. This produced 1 minute averages of the data streams. Incoming data were lost during this process. The averaged file was transferred by ftp to the unix system where two programs were used to convert the ascii data to pstar. The data were read by pascin and time in seconds was generated by jlogtm from H, M, S, D, M, Y.

The NMEA sentences were defined as follows:

$LGGLL, geographical location
$LGZDA, universal time

#LGGRP,2,GG24 => GPS + GLONASS
#LGPAR,2,LAT01,LON01,TIM01,DAT01
#LGUNI,2,deg,deg,h:m:s,t:m:j

#LGGRP,4,Gyro-Kompass
#LGPAR,4,HDT01
#LGUNI,4,deg

#LGGRP,6,Doppler-Log
#LGPAR,6,SPD01,OTE01
#LGUNI,6,kn,NM

#LGGRP,3,ADU2 => 3D -_GPS
#LGPAR,3,HDT01,OXY01,CSP01
#LGUNI,3,deg,deg,deg

#LGGRP,5,Echolot
#LGPAR,5,DPT01
#LGUNI,5,m

#LGGRP,7,DWD-Milos
#LGPAR,7,WDI01,WDI01,WSP01,WSP01,ATE01,HUM01,APR01,RAD01
#LGUNI,7,deg,deg,m/s,m/s,xC,%,hPa,xC

note the final parameter given as “RAD” with units xC. This is water temperature with units °C.

#LGGRP,8,ThermoSal
#LGPAR,8,TEM01,CON01,SAL01,SIG01
#LGUNI,8,xC,ms/cm,PSU,kg/m3

NMEA – Adrian Lester and John Allen

The on board data logger

Poseidon is equipped with an x86 MS® DOS based data logging computer. Files may be retrieved from this system by FTP but to do so requires cessation of data recording during the process, which takes some time, alternatively there is a continuous NMEA data output from an RS232 serial port. An additional problem with the PC data logger on board is that rather than recording data continuously it averages the values over minute long periods and records the results of this.

A decision was made because of these considerations to use the RS232 NMEA feed. The systems on board comprised x86 machines running MS® Windows®, Sun® workstations running Solaris® and assorted Apple® machines; this combination of hardware and software did not prove appropriate for immediately recording and manipulating the data stream.

First attempts and diagnosis.

An initial attempt to acquire data was made using a USB to serial adapter connected firstly to an Apple® iBook® running OSX and secondly to the Linux based iBook® of one of the scientific party. A lack of drivers for the adapter made impossible further progress with the first of these machines and problems setting the baud rate using the

second resulted in unreadable data though the existence of the transmission was proved. Next a Windows 98® x86 PC was used to display via Hyperterminal® the correct NMEA sentences at a baud rate of 4800. While the information could be viewed by this means no spare machines of this type were available, their stability was not suitably trusted and the limitations of the operating system denied the possibility of redirecting the data in any way but for writing it to a file.

An Apple® Powerbook® with a serial port was then connected to the RS232 cable via an adapter, under OSX the data acquired by means of the command:

```
# cat /dev/ttymodem-printer
```

was unreadable despite attempts to set the baud rate correctly. This may have been because the port settings applied through the graphical interface were not recognised by the underlying operating unix-like system.

Under Mac OS9® with Zterm®, however, data was successfully viewed as it had been with Hyperterminal® and as with Hyperterminal® a record could be written continuously to a file. It was therefore decided to use this technique and periodically transfer the current version of the file to another machine for processing but another level of complexity was added by an inability to read an open file by means of a network share.

The final solution.

An Apple® Powerbook® was used to log the data obtained from the RS232 NMEA feed via an adapter to file. This operation was performed using ZTerm® under MacOS9® and the file was periodically retrieved to a system running MacOSX® by means of network sharing. The retrieval process proceeded as follows.

Firstly a copy of the file was made on the Powerbook using the Duplicate option of the “File” menu, then on the machine to which the file was to be retrieved the script grabnavdata.bash was run from the command line:

```
./grabnavdata.bash
```

This moved the copy of the data file to a subdirectory of that in which the script resided, naming it according to the approximate current time and date.

Another script, netcheckalive.bash, was left running on the OSX machine which checked each minute the existence of another file shared by the PowerBook in order to ascertain that the PowerBook had not crashed. It is important to ensure before using this that the system volume of the machine on which it is run is set to be suitably loud and that the “system bell” or “alert sound” selected is of a sufficiently noticeable nature that the audible alarm, which occurs in the event of a failed lookup, is heard. Also noteworthy is the fact that the alarm will sound in the event of network failure as well as that of the checked system ceasing to function.

Manual backups of the NMEA data files were periodically made to a solid state Firewire® drive.

Both the scripts mentioned above are listed below:

---------- grabnavdata.bash ----------

```
#!/bin/bash
DATADIR="/Network/Local/DeaconBook/Book9/Poseidon314" #Directory containing the growing file.
DESTDIR="pos314/navdata" #Destination for the local copies.
DESTFILE_WHOLE="underwaydata.log"
#
DATESTAMP=`date +%d%m%y%H%M%S`
```

```
#
DATAFILE=`ls $DATADIR/*copy`
cp "$DATAFILE" $DESTDIR/$DESTFILE_WHOLE-temp
/bin/rm "$DATAFILE"
#
OLDONE=`ls $DESTDIR/*$DESTFILE_WHOLE`
#If performing operations on the file such as copying out the data since last grab that
#		code can go here in order to simplify the filenames in this script.
mv $DESTDIR/$DESTFILE_WHOLE-temp "$DESTDIR/$DATESTAMP$DESTFILE_WHOLE"
```

---------- netcheckalive.bash ----------

```
#!/bin/bash
CHECKPATH="/Network/Local/DeaconBook/Book9/Poseidon314/DONOT_DELETE.txt"
#
while [ 1 ]
	do
	if [ -e $CHECKPATH ]
		then
		echo Seems OK
		sleep 60
	else
		echo
		echo
		echo Check file dissappeared. Possible crash of Deaconbook.
		echo "    GET JOHN OR ADRIAN!!!!"
		echo
		echo "Control & c in this terminal stops the alarm."
		i=1
		while [ $i -le 10 ]
			do
			printf "\a"
			sleep 1
			i=$(($i+1))
			done
		fi
	done
```

A suggested system.

While the method described above was sufficient to maintain a record of the information produced by the ship's instruments it did not allow real time processing or viewing of that data and was not straightforward to implement. The PowerBook also proved unstable if the Zterm window was brought into focus. The author therefore takes this opportunity to propose an alternative flexible approach to scenarios of this kind.

A Unix-like operating system running on hardware which provided an RS232 serial port would be able to read in the data stream in real time and not only log it to a file but also provide it to other applications. For instance, output could be redirected to different destinations using tee and thereby logged while also displayed in the form of either scrolling NMEA sentences or individual readouts of the various parameters. The device, or a replicate thereof, might be opened by software such as gpsd which could then provide particular information on request to multiple clients for their own purposes; or an NMEA server could potentially be set up in order that any machine on the same network could access the stream in its raw form. Such an operating system and hardware combination could be provided using Linux® on an x86 machine. A low-end Pentium® would probably be perfectly adequate. Alternatively there are available on the market many single board industrial computers each offering a great variety of I/O systems. The usefulness of Linux® based x86 machines with good I/O

capability for debugging, data logging and networking applications is hard to overstate and it seems advisable to pack at least one such system when deploying a cruise in order to overcome technical difficulties such as those with the *Poseidon's* NMEA feed. If that system contained multiple network interfaces it could also under some circumstances prove invaluable, if correctly configured, as a network bridge.

Vessel mounted acoustic Doppler current profiler – *Jane Read, Gwenna Corbell*

The ship's acoustic Doppler current profiler was run throughout the cruise. The RDI 150 kHz system used data acquisition software version 2.48 (1986) and profiler software 17.07. Configuration of the system is listed in Appendix 4iii. A number of problems were encountered with the system hanging or crashing. This, combined with difficulties logging and deciphering the navigation data from the NMEA system meant that no routine processing of the vessel mounted ADCP data was attempted. Data were allowed to accrue in the PC pingdata files, even after system crashes and it was left to the system to open a new pingdata file automatically. Segments of data between crashes were identified and extracted into pstar files (Appendix 2).

CTD measurements, processing and calibrations – *John Allen, Stephanie Henson*

Introduction

In total 73 CTD stations were completed on cruise P314. Depths of the profiles ranged from 27m to 2685m. At shallow stations (~100m depth) Niskin bottles were typically fired at ~3 depths. For deeper stations 2 bottles were fired at the bottom, 3 to 4 bottles in the upper mixed layer and the others at regularly spaced or targeted intervals in the profile.

Sampling

From all CTDs samples were taken in the following order; oxygen, salinities, nutrients. At selected stations where a sub-surface chlorophyll maximum was observed chlorophyll samples were also collected from the top ~100m for post-cruise analysis. Chlorophyll samples were not collected for the purpose of calibrating the CTD's fluorometer on board.

Processing

The processing of the SeaBird CTD data followed a few significant changes to the the paths established during Discovery cruise 258 (D258), Marine Productivity I (Pollard and Hay, 2002). A discussion of these changes is given here.
Note that 6-digit station numbers were used throughout the cruise – 314nnn. In the following text the station numbers are often referred to as 314nnn since most scripts request just the last 3 digits of the number.

I. SeaBird Software (SeaSoft) Processing

The following steps were run on the binary 24 Hz data. Input file was ct314nnn.dat in directory "C:\PD314\raw", output file was ct314nnn.dat in subdirectory "C:\PD314\Processed" on the PC set aside for SeaSoft processing. A batch processing script, 'PD314Batch.txt' was set up to carry out the processing stages efficiently and repeatably.

```
Datcnv /i%1\*.dat /c%1\PD314_03_43oxy.con /p%1\DatCnv.psu /o%1
Wildedit /i%1\*.cnv /p%1\WildEdit.psu /o%1
```

```
Filter /i%1\*.cnv /p%1\Filter.psu /o%1
Alignctd /i%1\*.cnv /p%1\AlignCTD.psu /o%1
Celltm /i%1\*.cnv /p%1\CellTM.psu /o%1
Rossum /i%1\*.ros /c%1\PD314_03_43oxy.con /p%1\RosSum.psu /o%1
Trans /i%1\*.cnv /p%1\Trans.psu /o%1
BinAvg /i%1\*.cnv /p%1\BinAvg.psu /o%1
AsciiOut /i%1\*1Hz.cnv /p%1\Ascii_Out.psu /o%1
```

The stages in this SeaBird processing route were as follows:

i) Datcnv

Convert raw data, copy selected variables (set only to copy measured variables and derived salinity). The derived salinity at this stage is useful if others on the cruise (chemists, biologists etc.) require quick look ascii files - see AsciiOut (ix). It is dropped as a variable in PSTAR processing exec ctd1 and recalculated from the processed temperature and conductivity.

ii) Wildedit

Edits spikes in the 24 Hz data in preparation for averaging. We followed a more recent Cunningham et al. setup rather than Pollard here, this was run once rather than twice but with the first pass criteria set at 1 standard deviation, the second pass criteria to 2 standard deviations, and 10 data points in each scan. Conceptually this seems similar to the Pollard settings from D258, as the tightening of the pass criteria are offset by the smaller scan range over which departures from the mean are calculated.

iii) Filter

Once again following Cunningham, a filter step was inserted as suggested by SeaBird; the time constants were 0.03 for the low pass conductivity filter and 0.15 for the low pass pressure filter.

iv) AlignCTD

Advances the oxygen variable to match timing of other variables. As Pollard discovered during D258, we found that a 10 second advance was preferrable to the 2-5 seconds discussed in the manual.

v) Celltm

This corrects the conductivity value for the systematic error related to the thermal inertia of the conductivity cell itself, the default constants of alpha = 0.03 and 1/beta = 7 were left unchanged. Both Cunningham et al. and Pollard had put this stage before the despiking and filtering of Wildedit and Filter. We began by following this order but soon found it to be a major mistake and an order not advised by SeaBird, we can only conclude that previous cruises had been very lucky with the size and frequency of temperature spikes. Celltm is quite a powerful program, it does not just put a time constant advance on conductivity, but uses the temperature difference between 24 Hz data pairs to estimate the effect of the cell's thermal inertia. Consequently a remnant spike will create a large erroneous jump in conductivity that returns exponentially with time. Thus Celltm should only be used after despiking. Indeed bearing in mind that this addresses a distinctly second order error (only 0.005 in salinity in regions of extreme temperature gradients according to the manual!) I have my doubts about the use of this rather powerful editing programme - there will always be 'spikes' that just evade one's favourite despiking criteria!

vi) Rossum

Averages the SeaBird data file to a '.ros' file with just one value per bottle.

vii) Trans'late'

Converts the 24 Hz processed data file from binary to ascii (and vice-versa if so required)

viii) BinAvg

This was used to create a 1Hz version of the 24 Hz data file for quick look purposes, and .....

ix) AsciiOut

Was then used rather than Trans to create an ascii 1Hz output file without the large file header. This provided a quick look ascii file for others on board, typically chemists and biologists.
Output ascii files for PSTAR processing were ct314nnn.cnv and ct314nnn.btl. All files were ftp'd to the unix directory for backing up and further processing.

II. Pstar Processing

i) **ctd0**

Translates the 24 Hz SeaBird ct314nnn.cnv file into pstar format. Requires the latitude and longitude of the bottom of the cast. These are manually entered from details on the cast logsheet, but can be automatically checked and corrected later. Output ct314nnn.24hz

ii) **ctd1**

Performs further editing of 24 Hz file, averages into 1 Hz data, calculates derived variables salinity, potential temperature and density. Output ct314nnn.1hz

ii) **ctd2**

Requires datacycle numbers of the first good in-water data (i.e. after soaking), the bottom of the downcast (maximum pressure (obtained by running pbotom)) and the last in-water data (first and last obtained manually by listing ct314nnn.1hz using mlist). Extracts data from the 1 Hz file to produce the entire in-water 1 Hz cast (ct314nnn.ctu) and the downcast profile averaged to 2dbar intervals (ct314nnn.2db).

iii) **ctdplots**

Produces standard profile and temperature-salinity plots for deep and shallow stations.

iv) **sam0**

Converts the ascii .btl file into a pstar file that contains the CTD variables from the bottle firing times. Output fr314nnn.

v) **sam1**

Converts the firing file into a master sample file, into which bottle oxygen, nutrient and salinity data are pasted. Output sm314nnn.

vi) **passam**

Pastes ascii sample (oxygen, nutrient or salinity) data into the master sample file. Requires tab-delimited text file with sample numbers that match those already in the sm314nnn file (convention for sample number is nnn01 to nnn12).

The following steps were not run at sea.

vii) **oxycalib**

After pasting in the bottle oxygen data, this script re-calculates the bottle oxygen in units umol/kg for direct comparison with CTD oxygens (new variable botoxyk in sm314nnn).

viii) **makeresid**

Calculates the bottle conductivity (using bottle salinity and CTD pressure and temperature). Calculates the difference between bottle and CTD oxygens, bottle chlorophyll and CTD fluorescence, bottle salinity and CTD salinity, and bottle conductivity and CTD conductivity. Can be run with some bottle data absent, re-run as necessary. Output file rs314nnn.

ix) **ctd4**

Checks the true position and water depth from the master navigation and master bathymetry files. Allows user to correct the information in all CTD and sample files.

Poseidon 314 was a short and very successful cruise with no weather down-time. As a result the frequency of CTD stations remained high and many more CTDs were completed than expected. On the other hand the scientific complement on *Poseidon* is severely limited by berth space. As a result there was insufficient time to complete stages vii, viii and ix on board.

Calibrations

i) Salinity

The bottle salinity samples are taken with the express purpose of performing final calibration of the conductivity sensor. The calibration is based on the assumption that the bottle samples measure the absolute salinity (to within 0.0001); see section on Salinometry. The procedure is to recalculate the bottle conductivity (using CTD temperature and pressure) and to compare that to the measured CTD conductivity. There was insufficient time to properly carry out a calibration on board. Initial comparisons of CTD derived salinity and bottle salinity show that there may be considerable drift with time and that there may be a pressure dependent term that will need to be applied to the calibrations. However, until the conductivity values are compared and recalibrated these conclusions are weak.

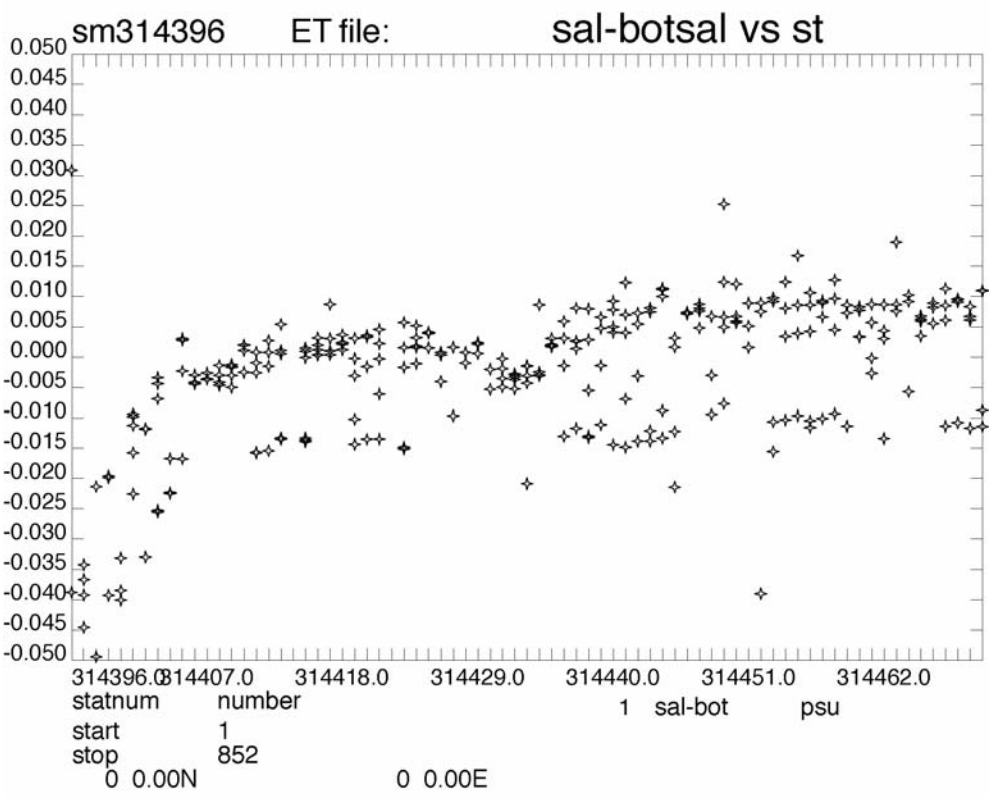


Figure 5a. Bottle – CTD salinity residuals plotted as a function of station number.

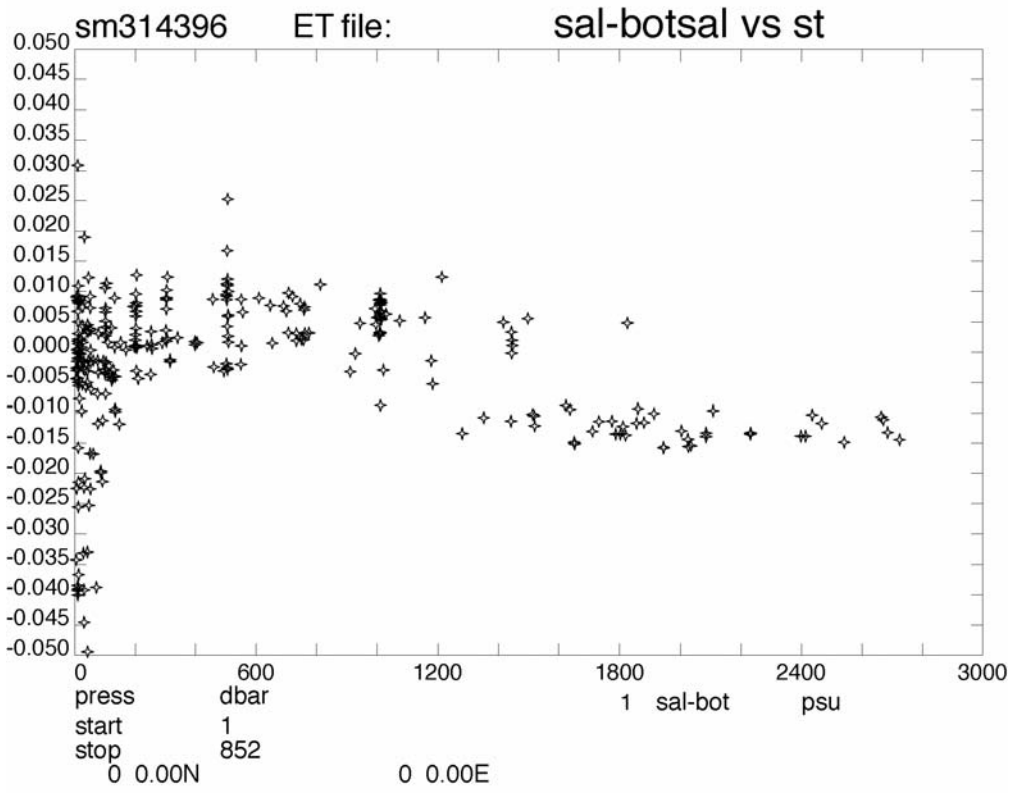


Figure 5b. Bottle – CTD salinity residuals plotted as a function of depth.

Salinometry – *John Allen, Stephanie Henson, Gwenna Corbel*

A Guildline Autosal salinometer (model 8400A) from the Institut fur Meereskunde, Kiel, (No. 3), was installed in the chemistry laboratory prior to boarding the vessel. A thermometer was used to measure the temperature of the chemlab, which varied between 21 and 26°C throughout the cruise. Efforts to maintain the chemlab at an appropriate temperature were hampered by temperature fluctuations associated with variations in the state of air conditioning or the number of doors to the outside, which were open.

A bubble remained stuck at the top of cell 2 and cells 3 and 4 were sometimes reluctant to fill. Standard seawater (SSW) batch P141 (k15 0.99993) was used throughout the cruise. The measurements of SSW before and after each crate occasionally showed large drifts of up to 0.00052 in conductivity (0.001 in salinity) over the time taken to process each crate. Generally though, the drift was ~0.0001 in conductivity (0.0001 in salinity). Due to a limited number of SSW bottles, crates were processed in batches of 2 or 3, which took 4-5 hours and were completed by 2 or 3 operators. These long runs may have contributed to the drifts seen in some of the SSW measurements. Duplicates taken from the same Niskin bottle (usually bottom depth), however, showed good agreement, with an r^2 about the 1:1 line of 0.98.

Salinity values were obtained from the double conductivity ratio measurements in the usual way, using an Excel spreadsheet, then transferred to the Unix system in the form of a tab-delimited ASCII file containing the four columns statnum, sampnum, botsala, botsalaf, botsalb, botsalbf, botsal and botsalf. Data from the ASCII files were incorporated into the sam files using the Pstar script passam.

Dissolved oxygen analysis – *Claire Holeton, Adrian Lester, Laura Bristow*

Samples were collected from the CTD rosette for analysis of dissolved oxygen at all stations from at least 8 bottle depths (fewer on shallower casts). Bubble-free samples were drawn through tubes from Niskins into 100ml calibrated glass oxygen bottles within approximately 20 minutes of recovery of the CTD rosette. Immediately following sampling the sample temperature was recorded and the samples were fixed with 1ml manganous chloride and 1 ml alkaline iodide solutions. These solutions were dispensed with variable quantity bottle top pipettes and prepared following Dickson AG, 1994 (Determination of dissolved oxygen in seawater by Winkler titration. WOCE operations manual; WOCE Report 68/91, Revision 1 Nov 1994). Samples were shaken vigorously twice: immediately following reagent addition and after settling for 20 minutes.

Once settled a second time (at least 40 minutes after fixation), samples were acidified with 1ml 12M hydrochloric acid, dispensed with a variable quantity bottle top pipette.

Oxygen concentrations were determined using a semi-automated Winkler titration system (manufactured by SiS; S/N 8002) to find the spectrophotometric end point. The SiS software was configured with settings determined from previous cruises:

Stepsize 10µl, wait time 5s, fast delay 5s, slow delay 5s, fast factor 0.5. This yielded a titration time of approximately 200s. The volumes of sodium thiosulphate required to titre the samples were used in an Excel spreadsheet for calculation of oxygen concentration following the equations described by Dickson (1994).

The sodium thiosulphate solution was standardized daily using a commercially prepared 0.00167M potassium iodate standard (Ocean Scientific International Laboratories, Petersfield, Hants.). Thiosulphate solution was prepared at the start of

the cruise and on day 198 (prior to station 436) by dissolving 25 g sodium thiosulphate in 1 litre Milli-Q water. The breakdown of the solution was monitored daily by calibration with a commercially prepared potassium iodate standard (0.01N) from OSIL.

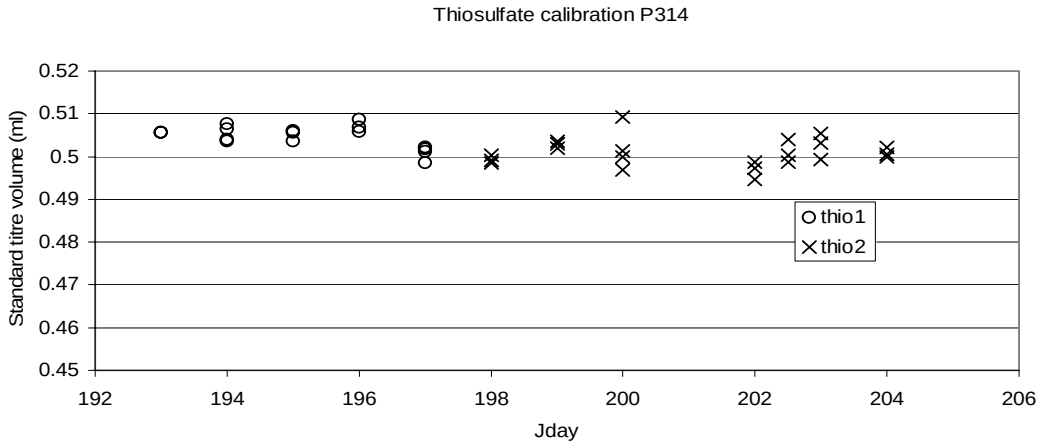


Figure 6. Thiosulphate calibrations as used for dissolved oxygen analysis.

The daily average of triplicate standard titre volumes was used in the Excel spreadsheet calculation of oxygen concentration. Reagent blanks were assumed to be 0.001 ml. Previous experience on cruises with the SIS equipment using similar pipettes had demonstrated that the level of precision did not allow accurate determination of the blanks as the blank titre volume was effectively below detection limits.

Duplicate samples (i.e. from the same Niskin bottle) were taken from at least one bottle (generally from the deepest bottle) at all stations. On average, there was a 0.57% difference between measurements of oxygen concentrations in duplicate samples (figure 7). A problem with duplicates, where the duplicate was always higher than the first drawn sample, was resolved by discarding the first shot of each reagent at the beginning of each sampling session.

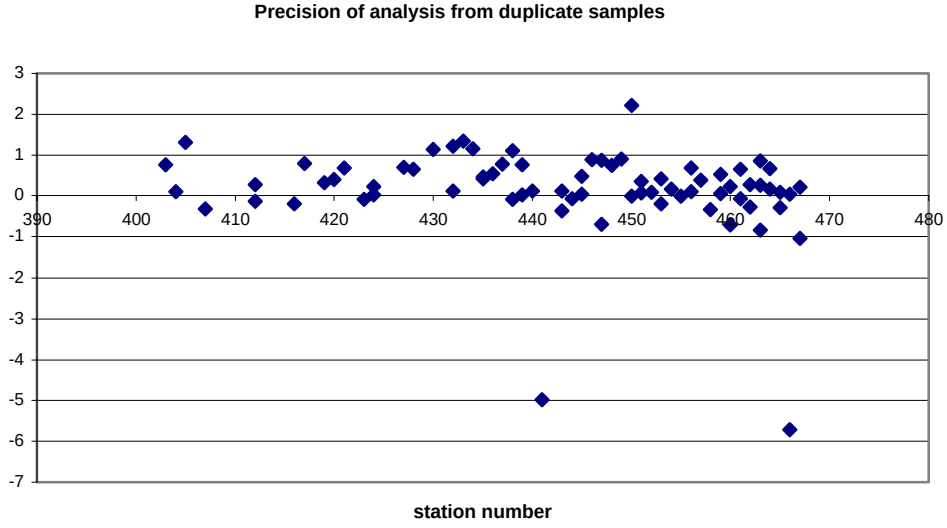


Fig 7. Precision of analysis from duplicate samples.

At stations near the beginning of the cruise samples were taken from different Niskin bottles at identical depths as there were concerns that leaky bottles had resulted in sample contamination.

Bottle-top pipettes were cleaned every 2-3 days by dismantling the parts and flushing with hot tap water. At station 446 a hand-held fixed volume Finn pipette was used for acidification while temporary problems with the bottle-top pipette were resolved. Thiosulphate solution was flushed through the dispenser daily for at least 5 minutes, ensuring any trapped bubbles were dislodged. After problems with bubbles in the dispenser tubes early in the cruise, the thiosulphate dispenser tip was left in a bottle of titrated sample or Milli-Q water between titrations.

Inorganic nutrients *Gary Fones and Laura Bristow*

Preamble

Analysis for nitrate + nitrite (hereinafter nitrate), phosphate and silicate was undertaken on a Skalar Sanplus autoanalyser following methods described by Kirkwood (1994) with the exception that the pump rates through the phosphate line are increased by a factor of 1.5 which improves reproducibility and peak shape. Samples were drawn from 10 L Niskin bottles into 25ml sterilin coulter counter vials and kept refrigerated at 4°C until analysis which commenced within 24 hours.

Stations were run in batches of 4-8 depending on sampling frequency regulated by depth of station. Stations were generally run in batches of 4-7 with most runs containing 4 or 5 stations. In total 73 stations were sampled over an 11 day period facilitating in 12 runs being undertaken on the autoanalyser with a total of 722 samples being analysed (not including standards, blanks, replicates, etc.).

An artificial seawater matrix (ASW) of 40 g/l sodium chloride was used as the intersample wash and standard matrix. The nutrient free status of this solution was checked by running Ocean Scientific International (OSI) nutrient free seawater on every run. A single set of mixed standards were made up at the start of the cruise and used throughout the cruise, new standards were made as and when they were needed. These were made using OSI nutrient standard solutions (Nitrate and Silicate, 1000 μm; phosphate, 100 μm) by diluting the solutions with ASW into 250 mL plastic volumetric flasks that had been cleaned by soaking for 6 weeks in MQ water. Standards used were 20, 10, 5 μm for nitrate and silicate and 2, 1, 0.5 μm for phosphate. This was in an effort to minimise the run to run variability in concentrations observed on previous cruises. An OSI nutrient standard solution of 10 μm nitrate and silicate and 1 μm phosphate was made fresh every two days and run routinely after every 15-20 samples to monitor the analytical drift and to ascertain the accuracy of the technique along with monitoring the potential degradation of the standards over the 12 day period. The efficiency of the Cd reduction column was monitored by running a nitrite standard every run. Initially a standard of 10 μm was made but this appeared to have degraded after only three days giving greater than 100% efficiency. Due to the limited amount of Nitrite stock (100 μm, 50 mL) a standard of 2 μm was made fresh every other day to monitor the column efficiency, this approach was successful giving an efficiency close to 100% with no degradation.

Data transfer to another computer was the main problem in working up the data. Only a shared floppy disk drive was available so the data processing had to be undertaken using the Skalar proprietary software on the laptop running the autoanalyser and then

the text files transferred to another laptop periodically work on the data, this was not ideal and new investment in laptops or upgrades is essential before the next use of the autoanalyser.

The wash time was 90 seconds and sample time 75 seconds, the lines were washed daily with 0.25M NaOH (P) and 10% Decon (N, Si). Time series of baseline, bulk standard concentration, instrument sensitivity, calibration curve correlation coefficient, nitrate reduction efficiency and duplicate difference were compiled and updated on a daily basis.

Analyser performance

The performance of the autoanalyser was monitored via the following parameters: baseline value, calibration curve slope, regression coefficient of the calibration curve, nitrate reduction efficiency. Time series of these parameters are shown below in the following Figures.

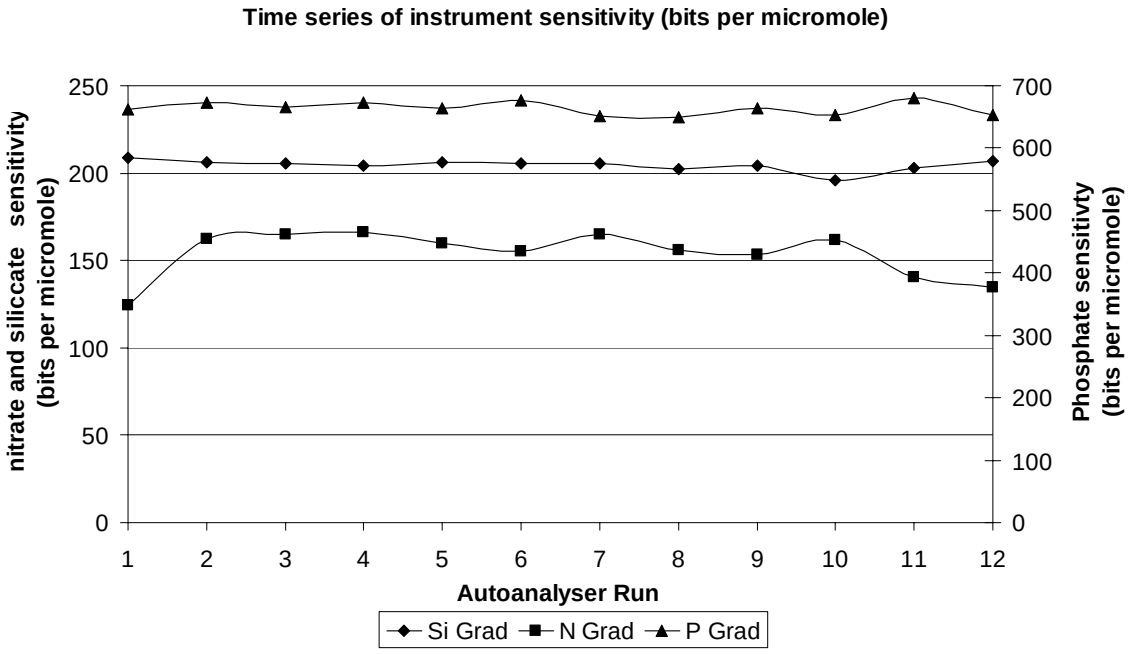


Figure 8. Time series of instrument sensitivity.

The instrument sensitivity for nitrate varied the most out of the three nutrients, varying by 8.5% over the 12 runs. However, this can be attributed to a bedding in period of the reduction column on run 1 and a dip in sensitivity on the last two runs indicating a need for the change in tubing. Phosphate and silicate sensitivity behaved much more reproducibly with these parameters varying by about 1.5% over the 12 run period of observations.

The quality of the calibration curves was excellent with 100% having regression coefficients of better than 0.999.

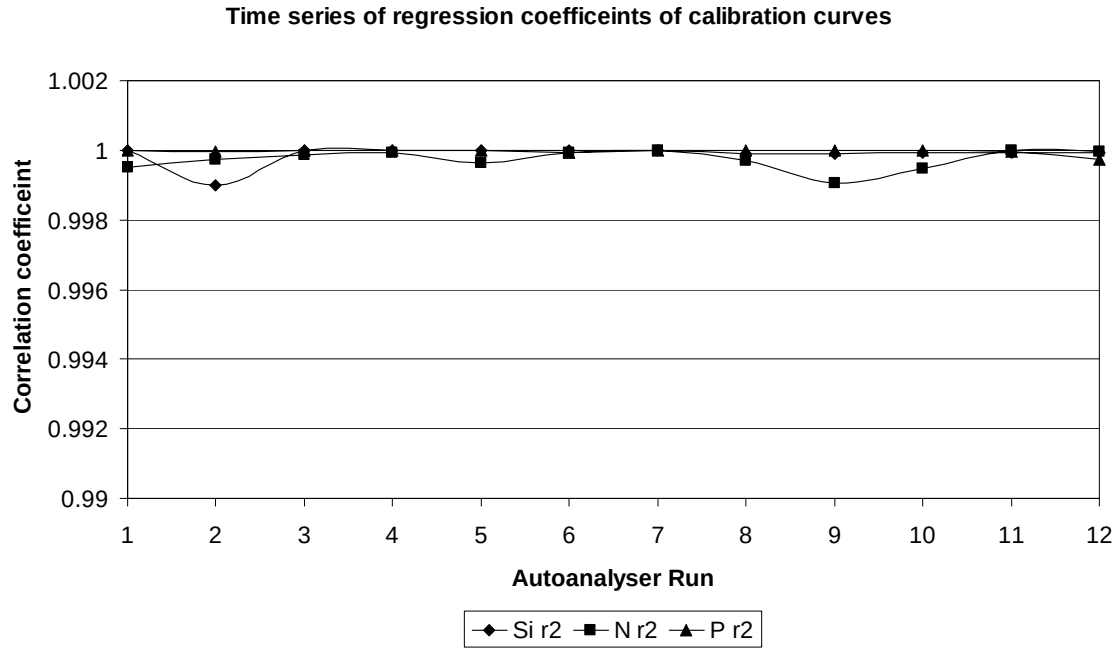


Figure 9. Time series of regression coefficients of calibration curves.

The reduction efficiency of the cadmium column was <100% during the early part of the cruise, when a 10 mm nitrate concentration was used and was deemed to have degraded very quickly. After this, a 2 μm solution was prepared every other day and gave a reduction efficiency for the rest of he cruise of 101%.

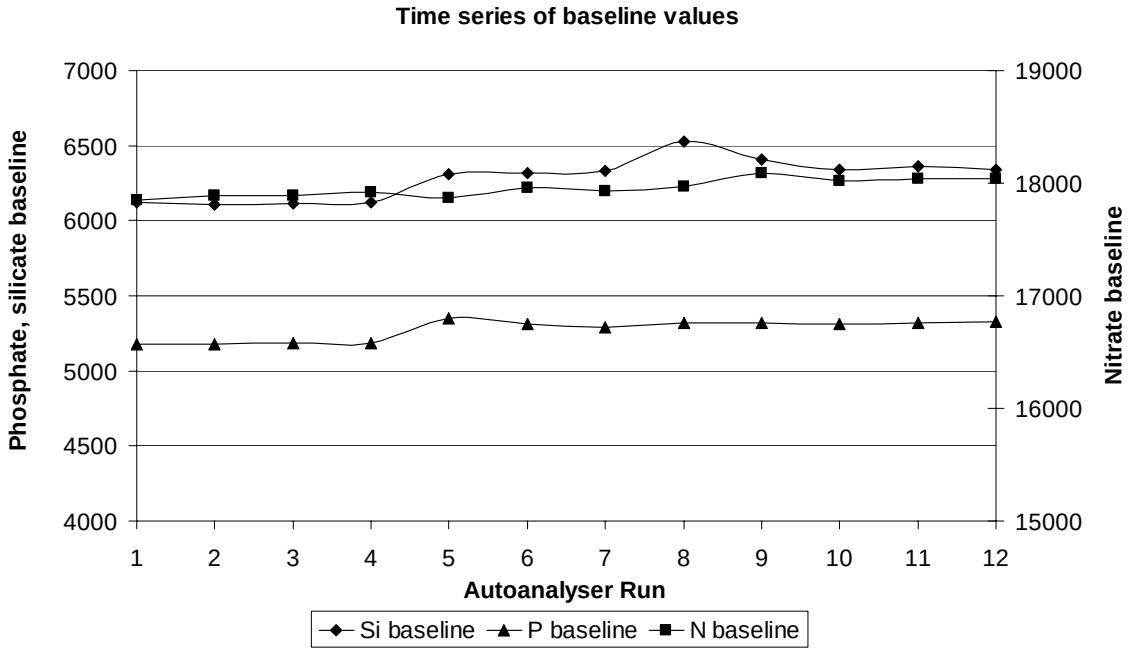


Figure 10. Time series of baseline values.

The baseline value of the instrument was relatively stable during the cruise, the phosphate increased after run 5 and then stayed stable, silicate increased slightly after renewing the reagents as did nitrate towards the end of the cruise in conjunction with a decrease in sensitivity indicating the need for the change of tubing and potential

contamination of the new reagents used. The percentage changes in baseline shift were extremely small in the region of 0.5 to 2%.

Data quality

Precision of measurements: The short term precision of the measurements was evaluated by running a duplicate sample per station (thus 3-4 per run). The Figures show the time series of the percentage difference between the duplicates for a) silicate b) nitrate and c) phosphate together with five point running means through the data.

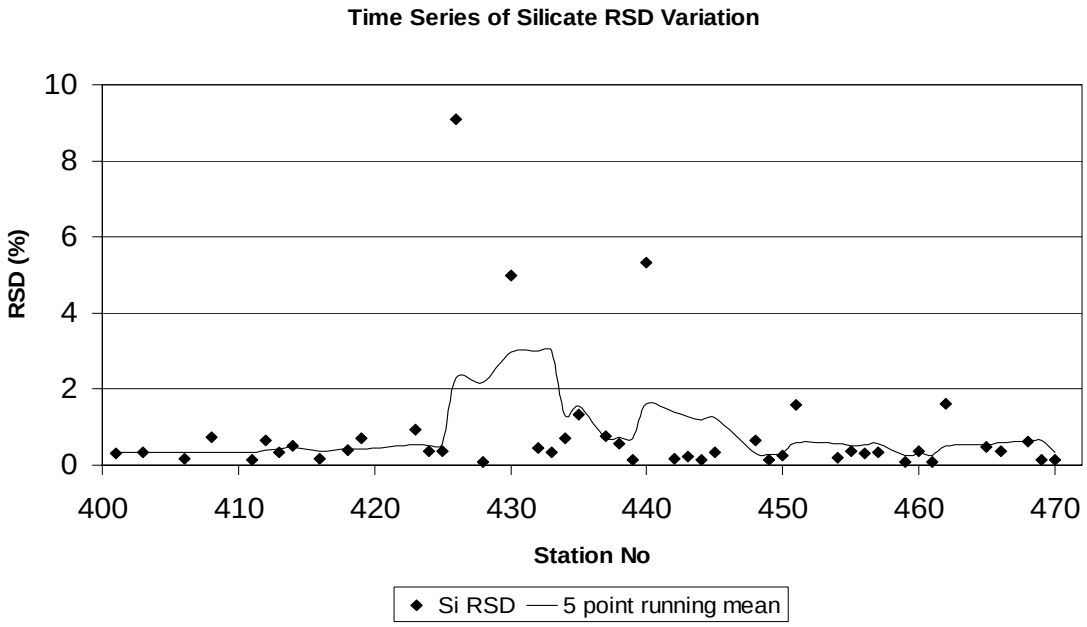


Figure 11a. Time series of silicate RSD variation.

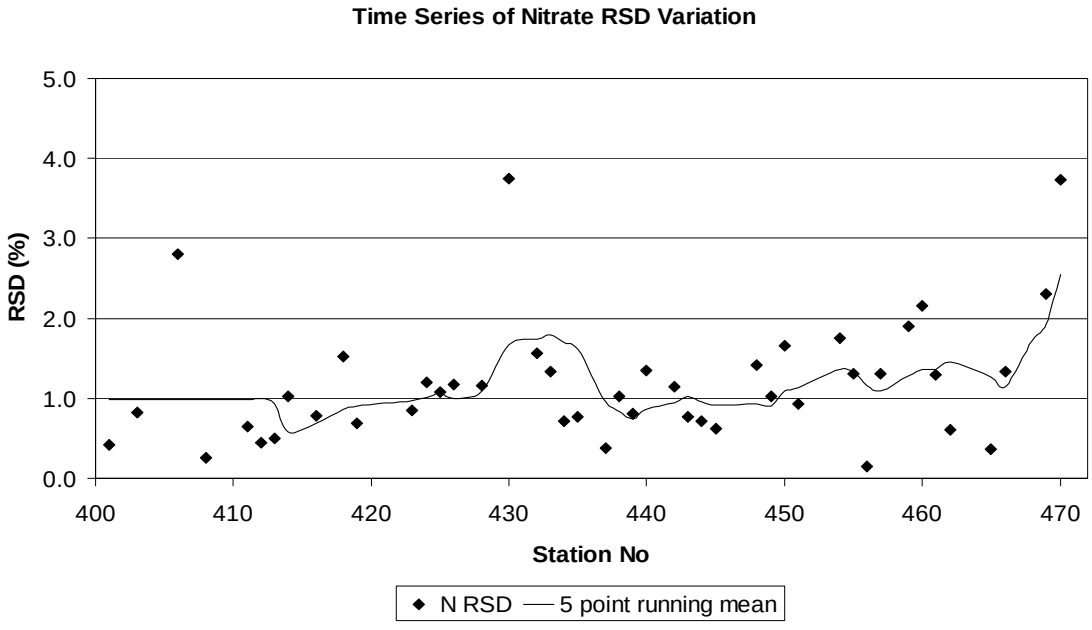


Figure 11b. Time series of nitrate RSD variation.

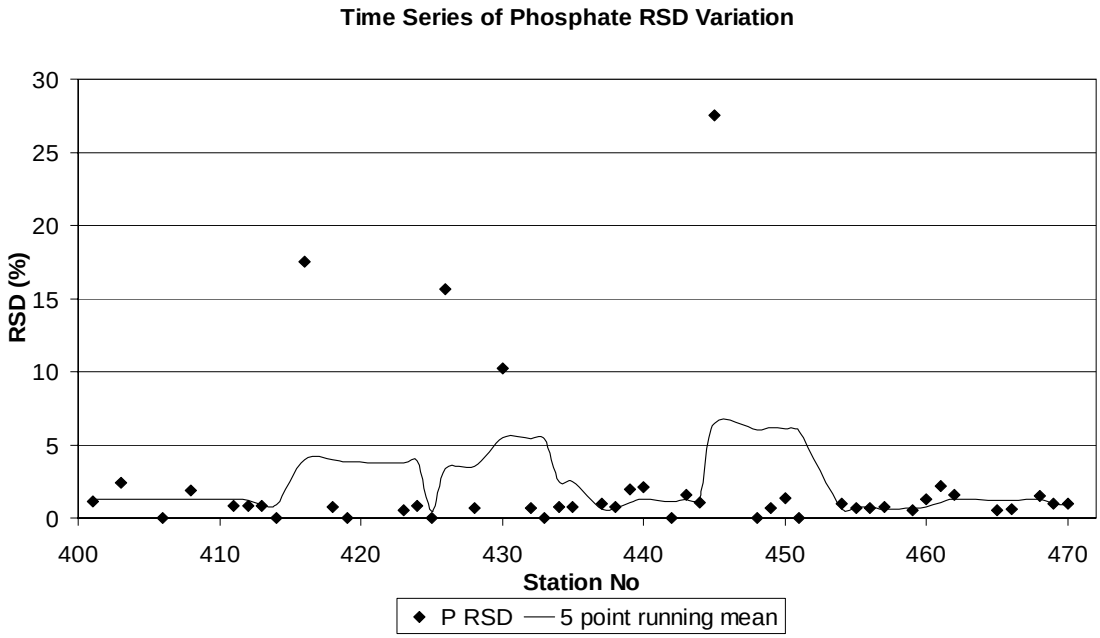
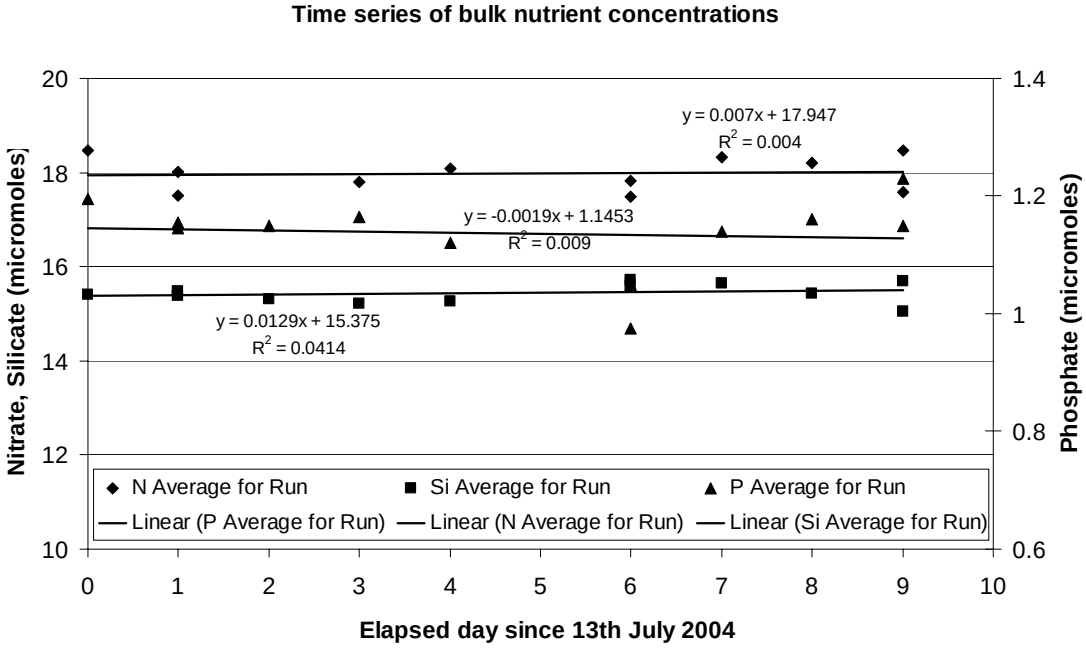


Figure 11c. Time series of phosphate RSD variation.

The mean differences for Si, N and P were 0.84, 1.27 and 2.33%. The precision was relatively stable during the cruise with only a few flyers in the data, these were mainly in the phosphate data resulting in the slightly higher precision than N and Si.

Internal consistency of measurements: This was evaluated by using a deep water sample taken at station 411 on 13/07/04 in 1920 m. A duplicate of this was analysed on every run. The concentrations of nitrate, phosphate and silicate in this sample over time are shown below.



Figures 12. Time series of bulk nutrient concentrations.

Nitrate, phosphate and silicate concentrations appeared to be invariant over time during the cruise. The variability of bulk nutrient concentration from the mean is indicative of the internal consistency of the dataset. This is relatively simple to evaluate for all the nutrients (Figures) as the concentrations appeared to be invariant. For nitrate the residual concentration appears to be normally distributed and shows no significant trend over time. The absolute average residual value for nitrate was 0.31 micromoles per litre or 1.7%. For phosphate and silicate the residual concentration again appears to be normally distributed and shows no particular trend over time. The mean residual values are 0.16 micromoles per litre or 1.05% for Si and 0.04 micromoles per litre or 3.8% for P.

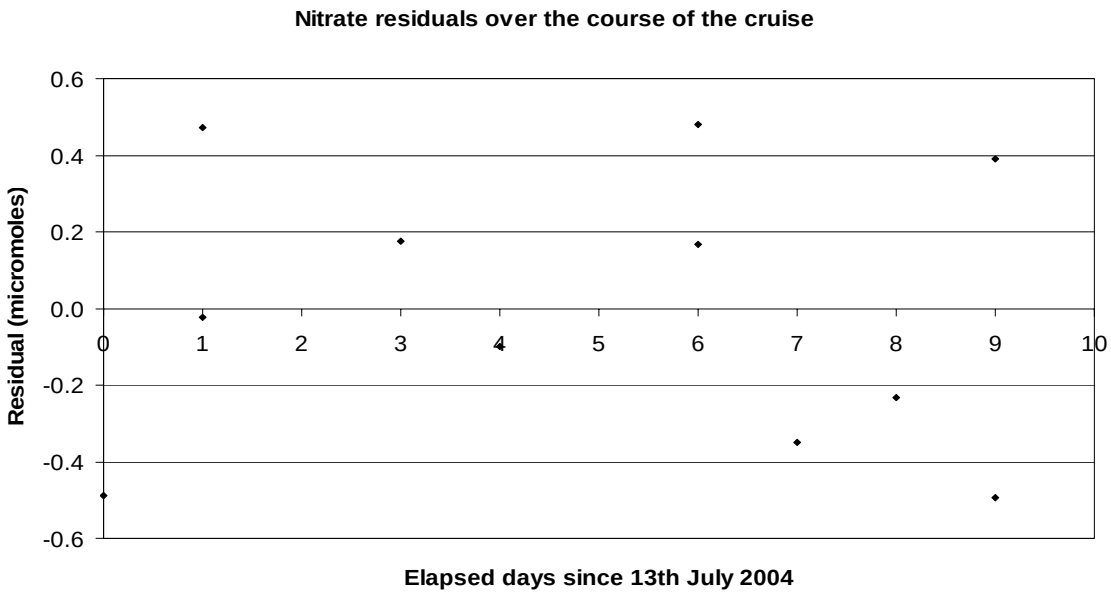


Figure 13a. Time series of nitrate residuals.

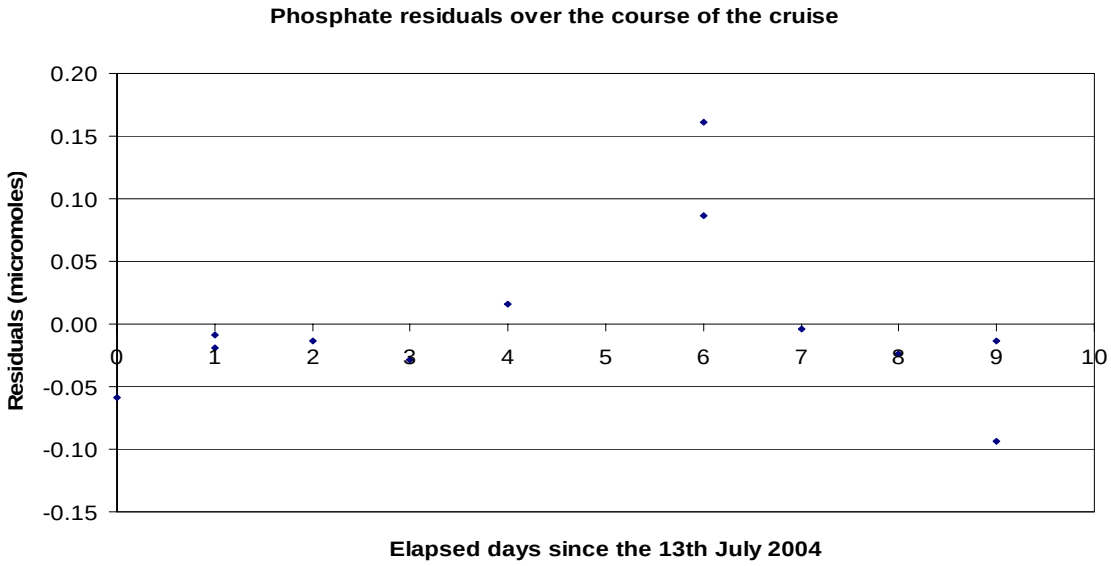


Figure 13b. Time series of phosphate residuals.

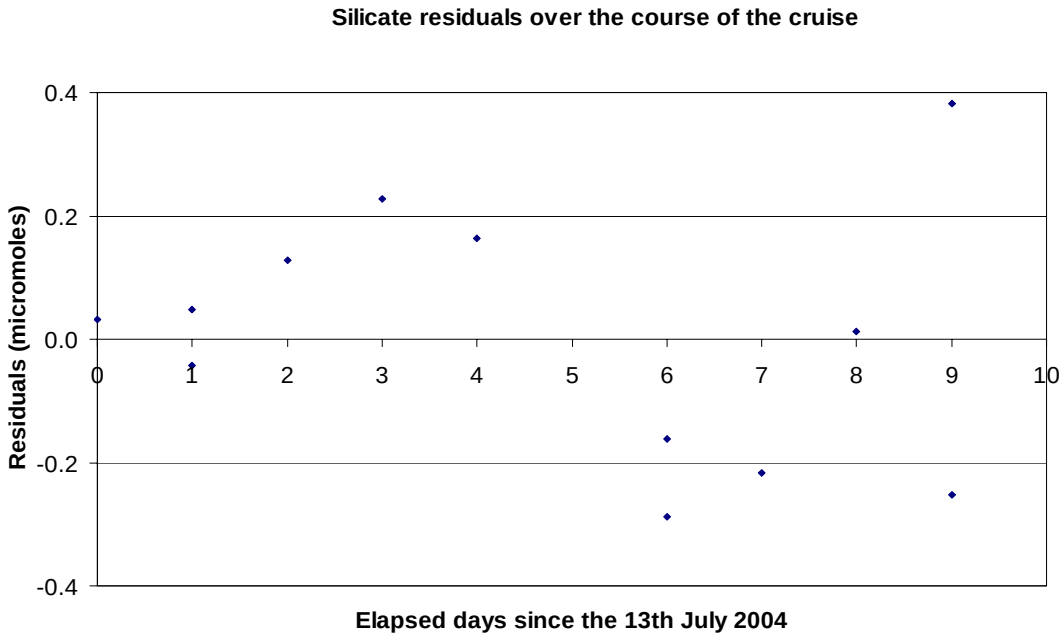


Figure 13c. Time series of silicate residuals.

Accuracy of measurements

The accuracy was monitored by use of OSI nutrient standard solutions, which were also used for the calibrations. An internal drift standard of 10 μmol N and Si and 1 μmol P was run every 12-18 samples. The analysis of these standards gave values of P 0.96 +/- 0.03 micromoles per litre for a nominally 1 micromolar solution, N 10.2 +/- 0.96 for a nominally 10 micromolar solution and Si 10.0 +/- 0.27 micromoles per litre for a nominally 10 micromolar solution. These imply that the P results are too high by about 4% and the N results too low by about 2%. The Si values showed no deviation from the expected concentration.

Pigment analysis – *Claire Holeton*

Phytoplankton pigment sampling was focused mainly at stations where trace-clean pole samples were taken, in an effort to provide a complete suite of measurements at these locations. At later stages of the cruise when more time was available to process samples, chlorophyll samples were taken at every station. Planned sampling of the underway surface seawater supply was abandoned early in the cruise. It was suspected that the underway water supply was of poor quality; after over 30 minutes of continuous flow though the lab taps, a strong fishy odor remained.

Chlorophyll samples were taken from Niskin bottles in the surface mixed layer (usually from 3-4 depths <=100m). At least one sample was taken from the subsurface chlorophyll maximum (SCM), if present. HPLC sampling was restricted to the depth at which the highest fluorescence was measured at stations where pole samples had been taken. A total of 106 chlorophyll samples were taken from 33 stations; 9 HPLC samples were also collected at stations where pole samples were taken.

Pigment samples were drawn into clear 1 or 2 l Nalgene bottles rinsed with sample and stored in a coolbox until filtration. The process was usually completed within an

hour of the recovery of the CTD rosette. Aliquots of 250 ml were filtered onto 25mm Whatman GF/F filters at low (<10 KPa) vacuum pressure until there was visible colour on the filter paper, usually to a total volume of 500 ml. Larger volumes were filtered for HPLC analysis: 500-1000ml. Filter papers were folded in half, wrapped in foil and stored dry in plastic bags until analysis on return from sea.

Chlorophyll samples were initially stored in a freezer set to –20°C, however it was discovered on day 197 that the freezer went through a 20 minute defrost cycle daily, reaching temperatures in excess of +15°C. Consequently, chlorophyll samples from stations 406 to 426 (inclusive) are of questionable quality. At station 435 (jday 198), samples were moved to the freezer of the mini-fridge in the PI's cabin (–8 :–10°C) and subsequently (jday 199) moved to –40°C storage. All HPLC samples were stored for the duration of the cruise in a freezer set to –40°C, the coldest storage available. Pigment samples were returned from the ship to the lab on dry ice in a coolbox.

FRRF – *Claire Holeton*

A Fast Repetition Rate Fluorometer (FRRF) was used to monitor the physiological health of the photosynthetic machinery in the phytoplankton populations. It was operated primarily in conjunction with the sampling of surface iron concentrations, with the intention of observing physiological effects of iron limitation in the phytoplankton.

Samples were sub-sampled from the trace-clean pole sample into acid-washed dark bottles rinsed with a portion of the sample. Samples then underwent a 30 minute incubation at sea-surface temperature (i.e. using a continuous flow from the underway seawater supply) to remove all influence of non-photochemical quenching. Rough processing of data from samples collected early in the cruise suggested the 30 minute incubation was not removing the effects of photoinhibition in daytime samples. As recovery from photoinhibition can take up to several hours, subsequent sampling was restricted to periods of darkness or early dawn.

After incubation, bulk community measurements of dark-adapted physiology were acquired from samples with the FAST^{tracka} fast repetition rate fluorometer (Chelsea Instruments Ltd. S/N 182039). Communication with the instrument was facilitated using Microsoft® HyperTerminal from a laptop. The instrument was operated in benchtop mode, under conditions of near-complete darkness (i.e surrounded by rubble sacks and tin foil). Samples were poured into straight tubes screwed into the top and bottom of the dark chamber. The bottom tube was stopped up with UHU® White Tack that has been soaked in weak (1%) HCl to remove any residue. This setup allowed a very small amount of sample to be used to fill the sample chamber. Samples were removed from the chamber following acquisition by unscrewing the bottom tube.

32 acquisitions were acquired from each discrete sample using the following boot protocol settings (from the 'RUN' menu):

0	Acquisitions
16	Flash sequences per acquisition
100	Saturation flashes per sequence
4	Saturation flash duration (in instrument units)
0	Saturation interflash delay (in instrument units)
ENABLED	Decay flashes

20 Decay flashes per sequence
4 Decay flash duration (in instrument units)
120 Decay interflash delay (in instrument units)
30 ms Sleep-time between acquisitions
(1-4) PMT Gain in Normal mode*
DISABLED Analogue output
ENABLED Desktop (verbose) mode
INACTIVE Light chamber (A)
ACTIVE Dark chamber (B)
ENABLED Logging mode to internal flashcard
80 Upper limit Autoranging threshold value
20 Lower limit Autoranging threshold value

*the gain was adjusted for each sample so that the fluorescence was in an appropriate range.

Prior to each series of acquisitions, the instrument time was synchronized with the ship's navigational data. The dark chamber was rinsed following each period of use with Milli-Q filtered water. The optics in the dark chamber were cleaned every 2-3 days using a Kimwipe and weak (<1%) HCl.

To correct for background fluorescence in the seawater, a portion of the sample was syringed through a series of 3 in-line GF/F filters into the dark chamber. This 'blank' data was collected prior to the sample acquisition at the same settings as the corresponding sample acquisitions. Additional files for calibration and corrections for instrument noise (i.e. IRF files) were collected in the lab on return from sea. No significant processing of data was undertaken during the cruise; binary files downloaded from the instrument were converted to text equivalents using 'bin2asc' supplied as part of the V4 post-acquisition software developed by Sam Laney.

In addition to the samples collected by pole, water was drawn from the surface Niskin bottles (<50m) on several CTD casts following the pole sampling. Samples were drawn immediately following the recovery of the CTD rosette. The results from the CTD samples will be compared with those using the trace-clean pole collection to determine if CTD sampling is a feasible collection technique for future cruises investigating iron limitation of phytoplankton.

**additional files from last pole sample (taken at 2320) to determine if relaxation from photoinhibition occurred over the hours following sampling. This sample was incubated at sea temperature in an opaque bottle under low fluorescent lighting. A second pole sample taken at the same station (2325) was treated as previously described (i.e. incubation for 30 minutes in a dark bottle).

Table 1. Files logged for FRRF sampling

collected					incubation			file names	
jday	GMT	station	source	depth(m)	start	end	gain	sample	blank
195	0947	410	pole sample	0	0950	1032	1	410s01.raw	410b01.raw
				chamber cleaned and rotated to vertical orientation					
196	0959	419	pole sample	0	1001	1028	1	419s01.raw	419b01.raw
	1133	419	niskin 11	20	1154	1227	1	419s03.raw	
	1134	419	niskin 12	10	1219	1236	1	419s02.raw	
196	2215	423	pole sample	0	2216	2246	1	423s01.raw	423b01.raw
	2209	423	niskin 12	10	2222	2255	1	423s02.raw	
	2208	423	niskin 11	30	2222	2300	1	423s03.raw	
197	0353	426	pole sample	0	0355	0423	1	426s01.raw	426b01.raw
199	0126	438	pole sample	0	0128	0158	1	438s01.raw	438b01.raw
199	2227	442	pole sample	0	2230	2255	1	442s01.raw	442b01.raw
	2218	442	niskin 11	40	2233	2258	1	442s02.raw	
	2219	442	niskin 12	10	2234	2303	1	442s03.raw	
200	0015	443	pole sample	0	0019	0042	1	443s01.raw	443b01.raw
	0159	443	niskin 11	25	0207	0239	1	443s02.raw	
	0200	443	niskin 12	10	0208	0242	1	443s03.raw	
201	0114	451	pole sample	0	0117	0142	1	451s01.raw	451b01.raw
	0204	451	niskin 11	25	0216	0244	1	451s03.raw	451b02.raw
	0205	451	niskin 12	10	0216	0244	1	451s02.raw	
201	2317	453	pole sample	0	2319	2345	1	453s01.raw	453b01.raw
	2309	453	niskin 11	40	2327	2353	1	453s02.raw	453b02.raw
	2310	453	niskin 12	10	2329	2357	1	453s03.raw	
202	2320	459	pole sample	0	2320	2338	1	459s01.raw	
	2320	459	pole sample	0		0018	1	459s05.raw	
	2320	459	pole sample	0		0025	1		459b05.raw
	2320	459	pole sample	0		0121	1	459s06.raw	
	2320	459	pole sample	0		0246		459s07.raw	
	2325	459	pole sample	0	2325	2357	1	459s02.raw	459b01.raw
	2310	459	niskin 11	25	2335	0007	1	459s04.raw	459b02.raw
	2311	459	niskin 12	5	2335	0002	1	459s03.raw	

Dissolved iron sampling – *Gary Fones*

Preamble

The original plan for dissolved Fe sampling on PD314 was to test the new UKORS trace metal clean underway sampling fish, however due to problems on the trials cruises this was cancelled. In an attempt to obtain Fe samples to tie in with the nutrient data and FRRF analysis the SOC-SOES pole sampler was used to obtain trace metal clean samples for subsequent analysis of samples at SOC and FRRF analysis on board ship (see FRRF section).

Pole Sampling

The SOC-SOES pole sampler consisted of a 5 metre wooden pole with a plastic dipper attached at one end; into this, a 1 litre acid cleaned bottle could be placed. The procedure for deployment was to secure a line from the pole to the ship, and a line from the dipper held by a member of the crew. The first initial deployments of the pole sampler were undertaken as the vessel was coming onto station, this was later changed to when the vessel was moving of station at a speed on 1 knot, faster speeds

were deemed to dangerous for the operators. The pole was maneuvered over the side of the vessel close to the CTD deployment area, an initial rinse of the bottle was undertaken before the sample was taken. The pole sample was brought back on board and removed from the dipper and placed into a clean plastic bag, this was then immediately sub-sampled for FRRF analysis. The bottle was then taken and placed in the BassAire laminar flow cabinet ready for filtration. The number of samples taken was restricted due to watch times, and that the pole sample for FRRF needed to be undertaken at night to avoid quenching, subsequently only 13 pole samples (Table 2) were taken during the cruise.

TABLE 2: Pole Sampling Log

Station #	Date	JDay	GMT	0.4 μm	0.02 μm	FRRF	NUTS
410	13/07/04	195	0947	Y	Y	N	N
419	14/07/04	196	0959	Y	Y	?	N
423	14/07/04	196	2215	Y	Y	Y	N
426	15/07/04	197	0353	Y	Y	Y	N
438	17/07/04	199	0126	Y	Y	Y	N
442	17/07/04	199	2227	Y	Y	Y	Y
443	18/07/04	200	0015	Y	Y	Y	Y
451	19/07/04	201	0114	Y	Y	Y	Y
453	19/07/04	201	2317	Y	Y	Y	Y
456	20/07/04	202	1200	Y	Y	N	Y
457	20/07/04	202	1600	Y	Y	N	Y
458	20/07/04	202	1920	Y	Y	N	Y
459	20/07/04	202	2325	Y	Y	Y	Y

Filtration

The colleted sample was filtered into 2 fractions using an in house built vacuum filtration unit with a Savillex Teflon filtration filter rig. The two size fractions filtered were 0.4 μm and 0.02 μm; these are deemed to the dissolved and soluble fractions respectively (Wu et al. 2001). The bulk sample was filtered through Whatman Nuclepore 0.4 μm filters directly into 250 mL acid washed LDPE bottles. For the colloidal studies the 0.4 μm filtered water was filtered through Whatman Anodisc 0.02 μm filters. The cleaning procedure of the filters employed was based on that of the Boyle laboratory (MIT) and the LDPE bottle cleaning procedure was based on the Bruland laboratory (USC-SC) protocol. Total dissolved Fe in the two fractions will be measured in the laboratory at Southampton Oceanography Centre. The seawater will be subjected to UV irradiation and analysed using CSV with DHN (Obata and van den Berg 2001) as the added ligand. Total Fe values will also be determined using high-resolution isotope dilution inductively coupled plasma mass spectrometry after Mg(OH)2 coprecipitation (Wu & Boyle 1998).

Implications

Recent studies using microfiltration and low level Fe analysis by HR-ICP-MS indicate that soluble (<0.02 microns molecular diameter) Fe concentrations are much

lower than previously determined in the “dissolved” (<0.4 micron) fraction (Wu et al., 2001). A significant fraction of “dissolved” Fe may actually exist in the colloidal size range. These results suggest that “dissolved” Fe may be less bioavailable to phytoplankton than was previously thought and that colloidal aggregation may be an important Fe removal process in the ocean. It is hypothesised that the Iceland basin may be Fe limited as well as Si limited, these Fe speciation numbers in conjunction with collected nutrient data and the FRRf data which is a measure of phytoplankton stress may indicate whether this area could be a potential HNLC (high nitrate low chlorophyll) region.

References

Obata, H. and C. M. G. van den Berg (2001). "Determination of picomolar levels of iron in seawater using catalytic cathodic stripping voltammetry." Analytical Chemistry 73(11): 2522-2528.

Wu, J., E. Boyle, W. Sunda and L-S. Wen (2001). Soluble and colloidal iron in the oligotrophic North Atlantic and North Pacific. Science, 293, 847-849.

Wu, J. and E. A. Boyle (1998). Determination of iron in sweater by high-resolution isotope dilution inductively coupled plasma mass spectrometry after $Mg(OH)_2$ coprecipitation. Anal. Chim. Acta. 367, 183-191.

Float Deployments – *Jane Read*

Two floats were deployed in the Rockall Trough.

APEX float number 1517 was deployed at station M, *Poseidon* station number 414, immediately following CTD 413. Deployment took place at 22:00z 13 July 2004 at approximately 57° 17.5’N, 10° 24.2’W. Depth of water was about 2200m.

APEX float number 1516 was deployed at station F, *Poseidon* station number 422, immediately following CTD 421. Deployment took place at 18:00z 14 July 2004 at approximately 57° 30.55’N, 12° 14.97’W. Water depth was about 1800m. The float was deployed with the sensor covers on. Recovery was attempted but the float disappeared before it could be grappled and was presumed to have sunk.

No infomation was received from either float.

APPENDIX 1. CTD Station List

Station number	name	jday	date	start time	down time	end time	latitude	longitude	water depth	wire out	max press	comments
			hhmm	hhmm	hhmm	°N	°W	m	m	db		
396	1G	194	12/07/04	1011	1017	1027	56 39.93	6 08.96	76	70	72	No O, F or ladcp
397	2G	194	12/07/04	1120	1123	1135	56 41.12	6 16.82	38	30	32	No O, F or ladcp
398	3G	194	12/07/04	1218	1222	1233	56 43.14	6 24.11	102	89	93	No O, F or ladcp
399	4G	194	12/07/04	1302	1308	1321	56 44.07	6 26.97	102	85	93	No O, F or ladcp
400	6G	194	12/07/04	1438	1441	1449	56 44.08	6 44.94	38	27	30	No O, F or ladcp
401	7G	194	12/07/04	1556	1600	1614	56 44.04	6 59.88	141	130	135	No O, F or ladcp
402	9G	194	12/07/04	1737	1743	1756	56 44.02	7 20.07	159	150	155	No O, F or ladcp
403	10G	194	12/07/04	1856	1903	1916	56 43.91	7 30.29	226	205	211	No F or ladcp
404	11G	194	12/07/04	2006	2009	2018	56 44.03	7 40.24	64	50	52	No ladcp
405	13G	194	12/07/04	2139	2144	2157	56 47.03	8 00.05	123	110	113	No ladcp
406	T	194	12/07/04	2326	2332	2346	56 51.08	8 20.03	139	125	128	No ladcp
407	S	195	13/07/04	0147	0152	0210	56 56.92	8 47.03	128	115	118	No ladcp
408	R	195	13/07/04	0314	0318	0334	56 59.96	9 00.03	135	120	124	No ladcp
409	Q	195	13/07/04	0443	0453	0514	57 02.96	9 13.22	334	310	316	No ladcp
410	P	195	13/07/04	0954	0959	1106	57 06.01	9 25.40	1446	1431	1447	
411	O	195	13/07/04	1229	1230		57 08.98	9 42.12	1927	1920	1946	
412	N	195	13/07/04	1607	1609	1733	57 14.35	10 03.74	2110	2050	2039	
413	M	195	13/07/04	1952	1954	2113	57 18.09	10 22.94	2210	2200	2233	
415	L	195	13/07/04	2327	2331	0108	57 22.05	10 40.33	2065	2060	2087	
416	K	196	14/07/04	0244	0247	0333	57 24.18	10 51.92	783	770	775	
417	J	196	14/07/04	0521	0522	0553	57 27.19	11 04.87	590	570	553	
418	I	196	14/07/04	0746	0759	0819	57 27.98	11 18.88	784	740	751	
419	H	196	14/07/04	1007	1042	1136	57 28.84	11 31.58	2018	2000	2027	
420	G	196	14/07/04	1326	1401	1447	57 29.36	11 51.04	1793	1780	1806	
421	F	196	14/07/04	1642	1711	1755	57 31.01	12 14.89	1801	1780	1789	

423	E	196	14/07/04	2105	2132	2210	57 31.99	12 37.91	1642	1630	1652
424	D	196	14/07/04	2331	2354	0028	57 32.30	12 52.09	1067	1060	1075
425	C	197	15/07/04	0138	0147	0211	57 33.08	13 00.04	295	285	291
426	B	197	15/07/04	0359	0406	0418	57 34.10	13 20.11	181	165	171
427	A	197	15/07/04	0612	0617	0626	57 34.70	13 38.17	117	105	110
428	13966	197	15/07/04	0825	0830	0838	57 32.77	13 56.88	142	130	134
429	13967	197	15/07/04	1224	1236	1257	57 48.70	14 30.06	350	335	344
430	13968	197	15/07/04	1624	1634	1654	58 03.29	14 59.78	564	550	551
431	13969	197	15/07/04	2008	2024	2049	58 17.65	15 30.06	940	920	929
432	13970	198	16/07/04	0007	0036		58 30.45	15 59.96	1190	1170	1184
433	13971	198	16/07/04	0442	0505	0540	58 44.19	16 30.58	1194	1180	1182
434	13972	198	16/07/04	0841	0900	0929	58 57.86	16 59.30	1085	1060	1023
435	13973	198	16/07/04	1231	1248	1316	59 09.83	17 28.90	741	735	734
436	13974	198	16/07/04	1553	1623	1704	59 19.86	17 47.90	1692	1690	1716
437	13975	198	16/07/04	1922	2003	2054	59 29.00	18 14.50	2443	2450	2469
438	13976	198	16/07/04	2333	0021	0120	59 41.16	18 45.59	2678	2670	2686
439	13977	199	17/07/04	0421	0503	0606	59 53.96	19 17.71	2679	2670	2672
440	13999	199	17/07/04	0858	0941	1035	60 04.86	19 50.60	2693	2685	2726
441		199	17/07/04	1520	1601	1655	60 29.98	19 59.54	2525	2525	2543
442		199	17/07/04	2050	2128	2220	61 02.66	20 00.11	2396	2390	2415
443		200	18/07/04	0030	0110	0201	61 15.25	20 00.16	2373	2364	2399
444		200	18/07/04	0356	0433	0520	61 30.10	19 59.97	2214	2200	1668
445		200	18/07/04	0732	0800	0840	61 44.96	19 59.89	1799	1790	1811
446		200	18/07/04	1045	1115	1200	61 59.47	20 00.29	1799	1790	1777
447		200	18/07/04	1401	1430	1504	62 14.87	20 00.13	1813	1805	1829
448		200	18/07/04	1700	1727	1804	62 29.99	20 00.05	1630	1615	1645
449		200	18/07/04	2002	2026	2057	62 45.03	20 00.40	1413	1400	1421
450		200	18/07/04	2246	2306	2334	62 59.89	19 59.72	1152	1145	1158
451		201	19/07/04	0138	0149	0207	63 15.11	19 59.90	301	298	303
452		201	19/07/04	0238	0247	0301	63 18.07	20 00.08	199	191	195
453		201	19/07/04	2137	2219	2311	60 22.39	20 35.32	2637	2625	2672
454		202	20/07/04	0231	0309	0401	60 39.10	21 19.31	2442	2400	2437

455	202 20/07/04	0738	0812	0854	60 55.24	22 06.73	2125	2110	2111
456	202 20/07/04	1133	1206	1248	61 05.05	22 39.55	1862	1855	1881
457	202 20/07/04	1436	1513	1558	61 11.63	22 56.53	1899	1890	1914
458	202 20/07/04	1803	1832	1915	61 19.44	23 23.33	1846	1840	1861
459	202 20/07/04	2204	2234	2312	61 27.34	23 49.11	1760	1750	1775
460	203 21/07/04	0300	0331	0408	61 43.84	24 39.95	1445	1450	1444
461	203 21/07/04	0606	0632	0706	61 50.90	25 03.82	1437	1435	1446
462	203 21/07/04	0902	0923	0954	61 59.29	25 30.03	1295	1270	1281
463	203 21/07/04	1113	1130	1158	62 04.52	25 48.92	693	685	692
464	203 21/07/04	1315	1331	1359	62 08.88	26 05.77	719	710	720
465	203 21/07/04	1514	1532	1559	62 13.94	26 22.25	1026	1025	1029
466	203 21/07/04	1754	1819	1857	62 20.26	26 45.49	1490	1478	1503
467	203 21/07/04	2112	2136	2206	62 29.44	27 19.78	1432	1425	1442
468	204 22/07/04	0024	0051	0127	62 38.67	27 54.89	1344	1345	1352
469	204 22/07/04	0343	0414	0456	62 47.89	28 30.13	1837	1830	1860
470	204 22/07/04	0710	0736	0812	62 56.68	29 05.77	1713	1710	1733

APPENDIX 2. Vesssel-Mounted ADCP Files

Source	Output	Header time		No bins	Data cycle	Logic record	Start time		End time	
		Day	Time				Day	Time	Day	Time
Pingdata.046	adp314.046.1	40710	163646	30	1440	339	40710	163646	40710	203145
	adp314.046.2	40710	203854	30	240	397	40710	203855	40710	211354
	adp314.046.3	40710	212404	30	4650	1484	40710	212405	40711	101405
	adp314.046.4	40711	103415	64	2944	1992	40711	103415	40711	120415
	adp314.046.5	40711	124731	64	192	2027	40711	124731	40711	125131
	adp314.046.6	40711	125559	64	2752	/	40711	125529	40711	141929
Pingdata.047	adp314.047.1	40711	142129	64	3392	586	40711	142129	40711	160529
	adp314.047.2	40711	160825	64	1136	/	40711	160825	40711	215424
Pingdata.048	adp314.048.1	40711	215625	64	14592	/	40711	215625	40712	053025
Pingdata.049	adp314.049.1	40712	053224	64	14592	/	40712	053224	40712	130625
Pingdata.050	adp314.050.1	40712	130825	64	3968	685	40712	130825	40712	151025
	adp314.050.2	40712	151323	64	256	731	40712	151323	40712	151924
	adp314.050.3	40712	152225	64	128	755	40712	152225	40712	152425
	adp314.050.4	40712	152823	64	1024	933	40712	152823	40712	155823
	adp314.050.5	40712	160236	64	576	1034	40712	160237	40712	161836
	adp314.050.6	40712	162249	64	128	1058	40712	162249	40712	162449
	adp314.050.7	40712	162829	64	5376	1984	40712	162829	40712	191430
	adp314.050.8	40712	191715	64	1408	2228	40712	191715	40712	195915
	adp314.050.9	40712	200340	64	1600	/	40712	200340	40712	205141
Pingdata.051	adp314.051.1	40712	205341	64	64	14	40712	205341	40712	205341
	adp314.051.2	40712	205735	64	1408	258	40712	205735	40712	213934
	adp314.051.3	40712	214238	64	2240	645	40712	214238	40712	225038

	adp314.051.4	40712	225418	64	320	702	40712	225418	40712	230218
	adp314.051.5	40712	230639	64	2368	1111	40712	230639	40713	001839
	adp314.051.6	40713	002305	64	7424	2389	40713	002305	40713	041306
	adp314.051.7	40713	041654	64	640	/	40713	041655	40713	043453
Pingdata.052	adp314.052.1	40713	043654	64	1984	344	40713	043654	40713	053653
	adp314.052.2	40713	053946	64	64	357	40713	053947	40713	053947
	adp314.052.3	40713	054336	64	320	414	40713	054336	40713	055134
	adp314.052.4	40713	055545	64	384	482	40713	055545	40713	060545
	adp314.052.5	40713	060816	64	2944	990	40713	060816	40713	073817
	adp314.052.6	40713	074100	64	7296	2246	40713	074100	40713	112659
	adp314.052.7	40713	113124	64	1472	/	40713	113125	40713	121525
Pingdata.053	adp314.053.1	40713	121724	64	14592	/	40713	121725	40713	195126
Pingdata.054	adp314.054.1	40713	195325	64	3904	674	40713	195325	40713	215324
	adp314.054.2	40713	215705	64	2816	1160	40713	215706	40713	232308
	adp314.054.3	40713	232651	64	7808	/	40713	232651	40714	032851
Pingdata.055	adp314.055.1	40714	033051	64	9216	1587	40714	033051	40714	081653
	adp314.055.2	40714	082044	64	5312	/	40714	082044	40714	110443
Pingdata.056	adp314.056.1	40714	110643	64	832	146	40714	110643	40714	113042
	adp314.056.2	40714	113455	64	4608	940	40714	113456	40714	135655
	adp314.056.3	40714	140029	64	2432	1360	40714	140030	40714	151428
	adp314.056.4	40714	151808	64	448	1439	40714	151808	40714	153009
	adp314.056.5	40714	153242	64	6208	/	40714	153243	40714	184444
Pingdata.057	adp314.057.1	40714	184642	64	14592	/	40714	184642	40715	022043
Pingdata.058	adp314.058.1	40715	022243	64	14592	/	40715	022243	40715	095642
Pingdata.059	adp314.059.1	40715	095843	64	14592	/	40715	095843	40715	173243
Pingdata.060	adp314.060.1	40715	173443	64	14592	/	40715	173443	40716	010842
Pingdata.061	adp314.061.1	40716	011043	64	14592	/	40716	011043	40716	084443

Pingdata.062	adp314.062.1	40716	084643	64	10624	1829	40716	084643	40716	141643
	adp314.062.2	40716	142230	64	896	1985	40716	142231	40716	144830
	adp314.062.3	40716	145932	64	128	2009	40716	145932	40716	150134
	adp314.062.4	40716	150520	64	2880	/	40716	150521	40716	163320
Pingdata.063	adp314.063.1	40716	163520	64	1280	223	40716	163520	40716	171321
	adp314.063.2	40716	171640	64	640	335	40716	171641	40716	173440
	adp314.063.3	40716	173745	64	256	381	40716	173745	40716	174345
	adp314.063.4	40716	174730	64	2624	834	40716	174730	40716	190731
	adp314.063.5	40716	191110	64	1984	1177	40716	191110	40716	201111
	adp314.063.6	40716	201532	64	384	1245	40716	201533	40716	202533
	adp314.063.7	40716	202907	64	1408	1489	40716	202907	40716	211109
	adp314.063.8	40716	215119	64	5888	/	40716	211519	40717	001720
Pingdata.064	adp314.064.1	40717	001919	64	2880	498	40717	001919	40717	014720
	adp314.064.2	40717	014955	64	1216	709	40717	014956	40717	022555
	adp314.064.3	40717	022900	64	10432	/	40717	022900	40717	075301
Pingdata.065	adp314.065.1	40717	075500	64	9728	1675	40717	075500	40717	125700
	adp314.065.2	40717	132023	64	64	1688	40717	132023	40717	132023
	adp314.065.3	40717	132731	64	768	1822	40717	132732	40717	134932
	adp314.065.4	40717	135323	64	768	1956	40717	135323	40717	141522
	adp314.065.5	40717	141943	64	3200	/	40717	141943	40717	155743
Pingdata.066	adp314.066.1	40717	155945	64	6656	/	40717	155945	40717	192543
Pingdata.067	adp314.067.1	40717	233543	64	14592	/	40717	233543	40718	070942
Pingdata.068	adp314.068.1	40718	071145	64	14592	/	40718	071145	40718	144543
Pingdata.069	adp314.069.1	40718	144743	64	448	80	40718	144743	40718	145944
	adp314.069.2	40718	150436	64	64	93	40718	150437	40718	150437
	adp314.069.3	40718	150755	64	704	216	40718	150756	40718	152757
	adp314.069.4	40718	153109	64	3200	768	40718	153110	40718	170910

	adp314.069.5	40718	171709	64	64	781	40718	171710	40718	171710
	adp314.069.6	40718	172339	64	256	827	40718	172340	40718	172940
	adp314.069.7	40718	173307	64	512	917	40718	173307	40718	174708
	adp314.069.8	40718	190117	64	1984	1260	40718	190119	40718	200117
	adp314.069.9	40718	200742	64	768	1394	40718	200744	40718	202944
	adp314.069.10	40718	203512	64	192	1429	40718	203512	40718	203913
	adp314.069.11	40718	204255	64	2112	/	40718	204255	40718	214655
Pingdata.070	adp314.070.1	40719	000003	64						
Pingdata.071	adp314.071.1	40719	073550	64	3008	520	40719	073550	40719	090750
	adp314.071.2	40719	091045	64	10432	2315	40719	091045	40719	143446
	adp314.071.3	40719	143845	64	1088	/	40719	143846	40719	151045
Pingdata.072	adp314.072.1	40719	151246	64	8384	1444	40719	151246	40719	193247
	adp314.072.2	40719	193703	64	6144	/	40719	193704	40719	224704
Pingdata.073	adp314.073.1	40719	224903	64	14592	/	40719	224904	40720	062305
Pingdata.074	adp314.074.1	40720	062504	64	7360	/	40720	062504	40720	101305
Pingdata.075	adp314.075.1	40720	140057	64	8512	/	40720	140057	40720	182458
Pingdata.076	adp314.076.1	40720	213657	64	14592	/	40720	213657	40721	051058
Pingdata.077	adp314.077.1	40721	051258	64	14592	/	40721	051259	40721	124658
Pingdata.078	adp314.078.1	40721	124858	64	14016	/	40721	124858	40721	200500
Pingdata.079	adp314.079.1	40721	202457	64	64	/	40721	202457	40721	202457
	adp314.079.1b	40721	202457	64	14592	/	40721	202457	40722	035858
Pingdata.080	adp314.080.1	40722	040058	64	64	/	40722	040058	40722	040058
	adp314.080.1b	40722	040058	64	14592	/	40722	040058	40722	113458

APPENDIX 3. Bridge Log

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio No.	Date	Time UTC	Description	LAT	LONG	WD m	course °	v kn	Press. hPa	Wea-ther	Wind deg/knts	Air temp °C	Wire Length m	Wire Length max m	Winch	Remarks
396	**12/7/04**	**3:30**	**Begin of Scientific works**													
		3:31	Arrival on station 1 G"	56-40,0 N	006-08,8 W	130	340	± 0	1014.4	c/o	335/19	12.70				
		3:46	CTD/Ros. to water	56-40,0 N	006-08,6 W	158	345	± 0	1014.40	c/o	332/17	12.50			W 2	Slack with 0,5-1,0m/s
		3:59	Heaving up	56-40,0 N	006-08,4 W	87	341	± 0	1014.50	c/o	335/14	12.50	88	88		Heaving with 0,5-1,0 m/s
		4:03	CTD/Ros. on deck	56-40,0 N	006-08,4 W	188	351	± 0	1014.50	c/o	329/16	12.30				Pressure sensor problem
		5:40	CTD/Ros. to water	56-40,0 N	006-08,9 W	124	340	± 0	1015.00	c	340/10	12.60			W 2	
		6:07	CTD/Ros. on deck	56-40,2 N	006-08,9 W	162	340	± 0	1015.10	c/r	344/8	12.10				Problem persisting
		9:07	CTD/Ros. to water	56-39,9 N	006-09,3 W	58	338	± 0	1016.20	b/c	327/15	13.30			W 2	Jane tries it again
		9:11	Heaving up	56-39,9 N	006-09,3 W	57	338	± 0	1016.20	b/c	327/15	13.30	10	10		
		9:13	CTD/Ros. on deck	56-39,9 N	006-09,4 W	56	338	± 0	1016.20	b/c	327/15	13.30				Problem persisting
		10:10	CTD/Ros. to water	56-39,9 N	006-08,9 W	86	318	± 0	1016,4	b/c	314/16	12.70				Changing to 12-bottle-CTD/Ros.
		10:20	Heaving up	56-39,9 N	006-09,0 W	70	322	± 0	1016.40	b/c	319/14	12.80	70	70		
		10:26	CTD/Ros. on deck	56-40,0 N	006-09,0 W	69	325	± 0	1016.40	b/c	319/16	12.90				
		10:33	Station completed	56-40,0 N	006-09,0 W	69	325	± 0	1016.40	b/c	319/16	12.90				
397	12/7/04	11:07	Arrival on station "2 G"	56-41,0 N	006-16,8 W	38	347	± 0	1016.50	b/c	327/14	12.80				
		11:18	CTD/Ros. to water	56-41,1 N	006-16,8 W	38	314	± 0	1016.70	b/c	334/13	13.00			W 2	Slack with 0,5-1,0m/s
		11:27	Heaving up	56-41,1 N	006-16,8 W	32	325	± 0	1016.60	b/c	327/14	12.60	30	30		Heaving with 0,5-1,0 m/s
		11:34	CTD/Ros. on deck	56-41,1 N	006-16,8 W	31	326	± 0	1016.60	b/c	328/16	13.20				
		11:41	Station completed	56-41,1 N	006-16,8 W	31	326	± 0	1016.60	b/c	328/16	13.20				
398	12/7/04	12:14	Arrival on station "Cairns of Coll"	56-43,0 N	006-24,1 W	94	326	± 0	1016.70	b/c	310/10	12.60				
		12:17	CTD/Ros. to water	56-43,0 N	006-24,1 W	94	325	± 0	1016.70	b/c	310/10	13.00			W 2	Slack with 0,5-1,0m/s
		12:32	Heaving up	56-43,3 N	006-24,1 W	87	330	± 0	1016.70	b/c	306/11	12.70	90	90		Heaving with 0,5-1,0 m/s
		12:33	CTD/Ros. on deck	56-43,3 N	006-24,1 W	87	330	± 0	1016.70	b/c	306/11	12.70				
		12:37	Station completed	56-43,3 N	006-24,1 W	96	304	± 0	1016.70	b/c	319/14	13.10				
399	12/7/04	12:57	Arrival on station "4 G"	56-44,0 N	006-26,9 W	85	312	± 0	1016.80	b/c	312/11	12.70				
		13:01	CTD/Ros. to water	56-44,0 N	006-26,9 W	90	314	± 0	1016.80	b/c	313/11	13.10			W 2	Slack with 0,5-1,0m/s
		13:15	Heaving up	56-44,1 N	006-27,0 W	95	316	± 0	1016.80	b/c	325/10	12.90	90	90		Heaving with 0,5-1,0 m/s
		13:20	CTD/Ros. on deck	56-44,1 N	006-27,0 W	116	316	± 0	1016.80	b/c	325/10	12.90				
		13:23	Station completed	56-44,1 N	006-27,0 W	120	319	± 0	1016.80	b/c	325/10	12.90				
400	12/7/04	14:34	Arrival on station "6 G"	56-44,0 N	006-45,0 W	35	334	± 0	1016.90	b/c	320/16	13.30				
		14:37	CTD/Ros. to water	56-44,0 N	006-45,0 W	35	334	± 0	1016.90	b/c	317/13	13.70			W 2	Slack with 0,5-1,0m/s
		14:44	Heaving up	56-44,1 N	006-45,0 W	32	336	± 0	1017.10	b/c	321/14	13.40	27	27		Heaving with 0,5-1,0 m/s
		14:48	CTD/Ros. on deck	56-44,1 N	006-44,9 W	34	349	± 0	1017.10	b/c	323/14	13.60				
		14:52	Station completed	56-44,1 N	006-44,8 W	35	319	± 0	1017.10	b/c	324/13	13.20				
401	12/7/04	15:52	Arrival on station "7 G"	56-44,0 N	007-00,0 W	137	350	0,0	1017.20	b/c	329/13	13.60				
		15:55	CTD/Ros. to water	56-44,0 N	007-00,0 W	137	350	0,0	1017.20	b/c	329/13	13.60			W 2	Slack with 0,5-1,0m/s
		16:03	Heaving up	56-44,0 N	006-59,9 W	137	350	0,0	1017.30	b/c	333/13	13.30		130		Heaving with 0,5-1,0 m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		16:12	CTD/Ros. on deck	56-44,1 N	006-59,8 W	136	350	0,0	1017.20	b/c	332/15	13.40				
		16:15	Station completed	56-44,1 N	006-59,7 W	135	350	0,0	1017.20	b/c	326/15	13.50				
402	12/7/04	17:34	Arrival on station "9 G"	56-44,0 N	007-20,0 W	156	330	0,0	1017.30	b/c	327/10	13.40				
		17:35	CTD/Ros. to water	56-44,0 N	007-20,0 W	156	330	0,0	1017,3	b/c	327/10	13.40			W 2	Slack with 0,5-1,0m/s
		17:42	Heaving up	56-44,0 N	007-20,0 W	156	328	0,0	1017,4	b/c	318/11	13.10	150	150		Heaving with 0,5-1,0 m/s
		17:55	CTD/Ros. on deck	56-44,0 N	007-20,2 W	156	328	0,0	1017.40	b/c	315/10	13.40				
		18:02	Station completed	56-44,0 N	007-20,2 W	156	302	0,0	1017.50	b/c	319/10	13.20				
403	12/7/04	18:40	Arrival on station "10 G"	56-44,0 N	007-30,0 W	215	340	0,0	1017.80	c	310/6	13.00				
		18:52	CTD/Ros. to water	56-44,0 N	007-30,1 W	220	340	0,0	1017,8	c	306/7	13.30			W 2	Slack with 0,5-1,0m/s
		19:02	Heaving up	56-43,9 N	007-30,3 W	223	340	0,0	1017,8	c	307/8	13.40		205		Heaving with 0,5-1,0 m/s
		19:15	CTD/Ros. on deck	56-43,8 N	007-30,4 W	226	340	0,0	1017.80	c	305/7	13.40				
		19:21	Station completed	56-43,8 N	007-30,5 W	235	340	0,0	1017.70	c	305/8	13.40				
404	12/7/04	20:00	Arrival on station "11 G"	56-44,0 N	007-40,0 W	47	300	± 0	1017.90	c	309/7	13.00				
		20:04	CTD/Ros. to water	56-44,0 N	007-40,1 W	47	295	± 0	1017.90	c	314/7	13.00			W 2	Slack with 0,5-1,0m/s
		20:10	Heaving up	56-44,0 N	007-40,2 W	47	300	± 0	1017.90	c	312/8	13.00		50		Heaving with 0,5-1,0 m/s
		20:17	CTD/Ros. on deck	56-44,0 N	007-44,4 W	61	300	± 0	1017.90	c	312/7	13.00				
		20:22	Station completed	56-44,0 N	007-44,6 W	61	300	± 0	1017.90	c	312/7	13.00				
405	12/7/04	21:37	Arrival on station "13 G"	56-47,0 N	008-00,0 W	120	325	± 0	1017.90	c/o	304/9	13.50				
		21:39	CTD/Ros. to water	56-47,0 N	008-00,0 W	119	325	± 0	1017.90	c/o	304/9	13.60			W 2	Slack with 0,5-1,0m/s
		21:47	Heaving up	56-47,0 N	008-00,0 W	119	316	± 0	1017.90	c/o	308/9	13.40		110		Heaving with 0,5-1,0 m/s
		21:57	CTD/Ros. on deck	56-47,0 N	008-00,0 W	119	324	± 0	1017.80	c/o	312/8	13.10				
		22:00	Station completed	56-47,0 N	008-00,0 W	119	325	± 0	1017.80	c/o	314/8	13.20				
406	12/7/04	23:22	Arrival on station "T"	56-51,0 N	008-20,0 W	135	296	± 0	1017.40	c/o	294/6	13.30				
		23:25	CTD/Ros. to water	56-51,0 N	008-20,0 W	135	299	± 0	1017.40	c/o	284/5	13.30			W 2	Slack with 0,5-1,0m/s
		23:34	Heaving up	56-51,1 N	009-20,0 W	135	300	± 0	1017.40	c/o	280/6	13.30	125	125		Heaving with 0,5-1,0 m/s
		23:46	CTD/Ros. on deck	56-51,2 N	008-20,0 W	136	301	± 0	1017.20	c/o	270/6	13.30				
		23:51	Station completed	56-51,2 N	008-20,0 W	135	289	± 0	1017.20	c/o	279/6	13.30				
407	13/7/04	1:45	Arrival on station "S"	56-57,0 N	008-47,0 W	125	289	± 0	1016.70	c/o	279/6	12.90				
		1:47	CTD/Ros. to water	56-57,0 N	008-47,0 W	124	297	± 0	1016.70	c/o	275/7	13.10			W 2	Slack with 0,5-1,0m/s
		1:56	Heaving up	56-56,9 N	008-47,0 W	124	301	± 0	1016.60	c/o	271/7	13.10	115	115		Heaving with 0,5-1,0 m/s
		2:09	CTD/Ros. on deck	56-56,9 N	008-47,2 W	124	294	± 0	1016.50	c/o	267/7	12.90				
		2:12	Station completed	56-56,9 N	008-47,2 W	125	300	± 0	1016.50	c/o	270/7	13.10				
408	13/7/04	3:10	Arrival on station "R"	57-00,0 N	009-00,0 W	132	285	0,0	1016.10	b/c	269/6	12.80				
		3:11	CTD/Ros. to water	57-00,0 N	009-00,0 W	132	285	0,0	1016.10	b/c	269/6	12.80			W 2	Slack with 0,5-1,0m/s
		3:21	Heaving up	57-00,0 N	009-00,1 W	131	285	0,0	1016.00	b/c	253/6	12.80	120	120		Heaving with 0,5-1,0 m/s
		3:32	CTD/Ros. on deck	56-59,9 N	009-00,1 W	131	285	0,0	1016.00	b/c	271/7	12.60				
		3:41	Station completed	56-59,9 N	009-00,1 W	130	285	0,0	1016.10	b/c	266/7	12.80				
409	13/7/04	4:40	Arrival on station "Q"	57-03,0 N	009-13,1 W	322	290	0,0	1015.70	b/c	234/6	12.80				
		4:43	CTD/Ros. to water	57-03,0 N	009-13,1 W	323	290	0,0	1015.70	b/c	234/6	12.80			W 2	Slack with 0,5-1,0m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		4:55	Heaving up	57-02,9 N	009-13,2 W	333	280	0,0	1015.70	b/c	212/5	12.90	310	310		Heaving with 0,5-1,0 m/s
		5:13	CTD/Ros. on deck	57-02,9 N	009-13,4 W	345	280	0,0	1015.60	b/c	213/6	12.70				
		5:17	Station completed	57-02,9 N	009-13,4 W	346	280	0,0	1015.60	b/c	216/6	12.70				
410	13/7/04	6:23	Arrival on station "P"	57-06,1 N	009-24,8 W	1412	vrs	vrs	1015.10	b/c	201/11	12.90				Changing to 24-bottle-CTD/Ros.
		9:49	2. Arrival on station	57-06,0 N	009-25,0 W	1417	221	± 0	1013.90	c/o	186/16	13.20			W 2	and back to 12-bottle CTD/Ros.
		9:54	CTD/Ros. to water	57-06,0 N	009-25,0 W	1417	221	± 0	1013.90	c/o	186/16	13.20				Slack with 0,5-1,0m/s
		10:00	Heaving up	57-06,0 N	009-25,0 W	1445	203	± 0	1013.80	c/o	198/15	13.30	1430	1430		Heaving with 0,5-1,0 m/s
		11:05	CTD/Ros. on deck	57-06,0 N	009-25,9 W	1491	206	± 0	1013.10	c/o	187/17	13.70				
		11:09	Station completed	57-06,0 N	009-26,0 W	1495	207	± 0	1013.00	c/o	194/18	13.60				
411	13/7/04	12:22	Arrival on station "O"	57-09,0 N	009-42,2 W	1932	192	± 0	1011.90	b/c	188/20	13.70				
		12:28	CTD/Ros. to water	57-09,0 N	009-42,1 W	1936	193	± 0	1011.80	b/c	186/19	13.40			W 2	Slack with 0,5-1,0m/s
		13:06	Heaving up	57-09,0 N	009-42,1 W	1931	191	± 0	1011.50	b/c	184/19	13.20	1920	1920		Heaving with 0,5-1,0 m/s
		13:54	CTD/Ros. on deck	57-09,0 N	009-42,5 W	1938	198	± 0	1010.50	b/c	186/19	13.00				
		13:56	Station completed	57-09,0 N	009-42,5 W	1936	190	± 0	1010.50	b/c	192/23	12.60				
412	13/7/04	16:02	Arrival on station "N"	57-14,0 N	010-03,0 W	2110	200	0.00	1007.70	o/r	173/20	13.10				
		16:07	CTD/Ros. to water	57-14,1 N	010-03,0 W	2201	200	0.00	1007.60	o/r	175/21	13.10			W 2	Slack with 0,5-1,0m/s
		16:44	Heaving up	57-14,4 N	010-03,8 W	2111	200	0.00	1006.70	o	174/21	13.00		2050		Heaving with 0,5-1,0 m/s
		17:08	Sample	57-14,5 N	010-04,0 W	2202	200	0.00	1006.20	o	185/21	13.60	1000			
		17:33	CTD/Ros. on deck	57-14,6 N	010-04,0 W	2113	200	0.00	1006.00	o	187/20	13.60				
		18:07	Station completed	57-14,4 N	010-02,9 W	2106	200	0.00	1005.80	o	197/20	13.70				
413	13/7/04	19:45	Arrival on station "M"	57-18,0 N	010-23,0 W	2215	260	± 0	1005.30	o/m/d	258/15	14.10				
		19:52	CTD/Ros. to water	57-18,0 N	010-23,0 W	2213	264	± 0	1005.50	o/m	262/15	14.00			W 2	Slack with 0,5-1,0m/s
		20:28	Heaving up	57-18,1 N	010-22,9 W	2212	270	± 0	1005.50	o/m/d	265/17	13.90	2200	2200		Heaving with 0,5-1,0 m/s
		21:13	CTD/Ros. on deck	57-18,2 N	010-23,0 W	2210	274	± 0	1005.80	o/m/d	261/15	14.20				
		21:25	Station completed	57-18,2 N	010-23,0 W	2211	274	± 0	1005.80	o/m/d	261/15	14.20				
414	13/7/04	21:58	Float No. 1 deployed	57-17,6 N	010-24,1 W	2223	252	1.40	1005.80	o/m/d	262/19	13.40				Float deployed by hand
		22:01	Station completed	57-17,6 N	010-24,1 W	2223	252	0.50	1005.80	o/m/d	262/19	13.40				
415	13/7/04	23:26	Arrival on station "L"	57-22,0 N	010-40,0 W	2107	290	± 0	1005.70	o/m/d	263/18	12.90				
		23:27	CTD/Ros. to water	57-22,0 N	010-40,0 W	2105	292	± 0	1005.70	o/m/d	263/18	12.90			W 2	Slack with 0,5-1,0m/s
	14/7/04	0:12	Heaving up	57-22,0 N	010-40,3 W	2067	293	± 0	1005.80	o/m/d	281/19	12.80	2060	2060		Heaving with 0,5-1,0 m/s
		1:06	CTD/Ros. on deck	57-22,3 N	010-40,6 W	2030	279	± 0	1006.00	o/m/d	274/19	13.40				
		1:11	Station completed	57-22,2 N	010-40,7 W	2020	259	± 0	1005.90	o/m/d	270/18	13.40				
416	14/7/04	2:43	Arrival on station "K"	57-24,0 N	010-52,0 W	785	291	± 0	1006.00	o/m/d	280/19	12.80				
		2:45	CTD/Ros. to water	57-24,0 N	010-52,0 W	785	287	± 0	1006.00	o/m/d	280/19	12.80			W 2	Slack with 0,5-1,0m/s
		3:07	Heaving up	57-24,2 N	010-51,9 W	784	290	± 0	1006.10	o/m/d	289/21	12.10	770	770		Heaving with 0,5-1,0 m/s
		3:33	CTD/Ros. on deck	57-24,5 N	010-51,7 W	784	300	0.00	1006.00	o/r	282/20	12.70				
		4:14	Station completed	57-24,3 N	010-52,1 W	776	300	0.00	1006.50	o	293/19	12.90				
417	14/7/04	5:18	Arrival on station "J"	57-27,0 N	011-05,0 W	589	315	0.00	1007.00	o/c	291/17	13.10				
		5:21	CTD/Ros. to water	57-27,0 N	011-05,0 W	587	315	0.00	1007.00	o/c	291/17	13.10			W 2	Slack with 0,5-1,0m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		5:32	Heaving up	57-27,2 N	011-04,9 W	588	315	0.00	1006.90	o/c	285/21	12.80		572		Heaving with 0,5-1,0 m/s
		5:54	CTD/Ros. on deck	57-27,4 N	011-04,6 W	591	315	0.00	1007.10	c	285/20	12.70				
		6:28	Station completed	57-27,4 N	011-05,0 W	587	275	0.00	1007.40	c	283/21	12.30				
418	14/7/04	7:39	Arrival on station "I"	57-28,0 N	011-19,0 W	759	290	± 0	1008.10	c/o	293/17	12.20				
		7:45	CTD/Ros. to water	57-28,0 N	011-19,0 W	750	292	± 0	1008.20	c/o	291/18	12.40			W 2	Slack with 0,5-1,0m/s
		8:02	Heaving up	57-28,0 N	011-18,8 W	749	294	± 0	1008.40	c/o	286/21	12.50	740	740		Heaving with 0,5-1,0 m/s
		8:19	CTD/Ros. on deck	57-28,0 N	011-18,8 W	757	293	± 0	1008.50	c/o	286/23	12.80				
		8:56	Station completed	57-27,6 N	011-19,7 W	757	280	± 0	1008.80	c	293/21	12.90				
419	14/7/04	10:00	Arrival on station "H"	57-29,0 N	011-32,0 W	2116	289	± 0	1009.30	c	274/17	13.10				
		10:08	CTD/Ros. to water	57-29,0 N	011-32,0 W	2116	279	± 0	1009.50	c	280/14	13.20			W 2	Slack with 0,5-1,0m/s
		10:44	Heaving up	57-28,8 N	011-31,6 W	2018	286	± 0	1009.60	c	274/15	13.20	2000	2000		Heaving with 0,5-1,0 m/s
		11:35	CTD/Ros. on deck	57-28,6 N	011-31,2 W	2016	286	± 0	1010.00	c	277/17	13.00				
		11:43	Station completed	57-28,5 N	011-31,2 W	2016	271	± 0	1010.20	c	276/16	12.80				
420	14/7/04	13:23	Arrival on station "G"	57-29,5 N	011-51,0 W	1793	267	± 0	1010.80	c	260/15	13.00				
		13:25	CTD/Ros. to water	57-29,5 N	011-51,0 W	1793	261	± 0	1010.80	c	260/15	12.80			W 2	Slack with 0,5-1,0m/s
		14:02	Heaving up	57-29,4 N	011-51,0 W	1891	282	± 0	1010.80	c	265/16	13.30	1780	1780		Heaving with 0,5-1,0 m/s
		14:47	CTD/Ros. on deck	57-29,4 N	011-51,1 W	1753	282	± 0	1010.80	c	269/16	13.00				
		14:49	Station completed	57-29,4 N	011-51,1 W	1753	282	± 0	1010.80	c	267/16	13.20				
421	14/7/04	16:38	Arrival on station "F"	57-30,5 N	012-15,0 W	1806	280	± 0	1010.80	c	267/13	13.00				
		16:43	CTD/Ros. to water	57-30,6 N	012-15,0 W	1806	280	± 0	1010.80	c	260/13	13.00			W 2	Slack with 0,5-1,0m/s
		17:12	Heaving up	57-31,0 N	012-14,9 W	1859	280	0.00	1010.50	c	260/21	12.40		1780		Heaving with 0,5-1,0 m/s
		17:54	CTD/Ros. on deck	57-31,6 N	012-14,9 W	n.a.	290	0.00	1010.60	c	286/11	12.00				
		18:05	Station completed	57-31,7 N	012-15,0 W	n.a.	260	0.00	1010.60	c	286/11	12.00				
422	14/7/04	18:09	Float No. 2 deployed	57-31,7 N	012-15,0 W	n.a.	260	0.00	1010.60	c	286/11	12.00				Float deployed by hand
		18:11	On station	57-31,7 N	012-15,0 W	n.a.	260	0.00	1010.60	c	286/11	12.00				Trying to recover float, no success
		19:12	Station completed	57-31,7 N	012-15,2 W	1801	vrs	vrs	1010.50	c	262/14	12.60				Float No. 2 assumed submerged
423	14/7/04	21:00	Arrival on station "E"	57-32,0 N	012-37,9 W	1644	268	± 0	1010.70	c	249/15	12.60				
		21:04	CTD/Ros. to water	57-32,0 N	012-37,9 W	1644	265	± 0	1010.70	c	260/16	12.60			W 2	Slack with 0,5-1,0m/s
		21:33	Heaving up	57-32,0 N	012-37,9 W	1643	269	± 0	1010.70	c	262/17	12.70	1630	1630		Heaving with 0,5-1,0 m/s
		22:10	CTD/Ros. on deck	57-32,0 N	012-38,0 W	1641	268	± 0	1010.80	c	244/16	12.20				
		22:20	Station completed	57-31,9 N	012-38,1 W	1641	244	± 0	1010.80	c	244/16	12.20				
424	14/7/04	23:27	Arrival on station "D"	57-32,5 N	012-52,0 W	1092	265	± 0	1010.70	c	250/15	12.60				
		23:30	CTD/Ros. to water	57-32,5 N	012-52,0 W	1090	258	± 0	1010.60	c	238/17	12.30			W 2	Slack with 0,5-1,0m/s
		23:58	Heaving up	57-32,3 N	012-52,1 W	1064	260	± 0	1010.60	c	248/15	12.60	1060	1060		Heaving with 0,5-1,0 m/s
		0:28	CTD/Ros. on deck	57-32,2 N	012-52,2 W	1053	262	± 0	1010.50	c	250/18	12.50				
		0:32	Station completed	57-32,1 N	012-52,2 W	1049	258	± 0	1010.50	c	254/17	12.40				
425	15/7/04	1:33	Arrival on station "C"	57-33,1 N	013-00,0 W	381	257	± 0	1010.30	c	245/20	10.90				
		1:37	CTD/Ros. to water	57-33,1 N	012-59,9 W	294	253	± 0	1010.30	c	245/19	11.00			W 2	Slack with 0,5-1,0m/s
		1:52	Heaving up	57-33,1 N	013-00,0 W	291	254	± 0	1010.10	c	235/15	11.90	285	285		Heaving with 0,5-1,0 m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		2:10	CTD/Ros. on deck	57-33,1 N	013-00,2 W	291	251	± 0	1009.90	c	223/12	11.60				
		2:14	Station completed	57-33,1 N	013-00,3 W	292	253	± 0	1009.80	c	220/13	11.70				
426	15/7/04	3:55	Arrival on station "B"	57-34,0 N	013-20,0 W	177	275	0.00	1008.80	c	260/21	11.40				
		3:58	CTD/Ros. to water	57-34,0 N	013-20,0 W	177	275	0.00	1008.80	c	260/21	11.40			W 2	Slack with 0,5-1,0m/s
		4:07	Heaving up	57-34,1 N	013-20,1 W	176	275	0.00	1008.90	c	257/17	11.60		165		Heaving with 0,5-1,0 m/s
		4:17	CTD/Ros. on deck	57-34,2 N	013-20,3 W	176	275	0.00	1008.90	c	243/12	11.70				
		4:49	Station completed	57-34,4 N	013-20,9 W	175	230	0.00	1008.70	c	232/12	11.70				
427	15/7/04	6:06	Arrival on station "A"	57-34,6 N	013-38,1 W	114	265	0.00	1008.40	c	249/13	11.50				
		6:12	CTD/Ros. to water	57-34,7 N	013-38,2 W	115	265	0.00	1008.40	c	248/11	11.40			W 2	Slack with 0,5-1,0m/s
		6:16	Heaving up	57-34,7 N	013-38,2 W	114	265	0.00	1008.40	c	234/11	11.40		105		Heaving with 0,5-1,0 m/s
		6:26	CTD/Ros. on deck	57-34,7 N	013-38,2 W	113	265	0.00	1008.30	c	222/13	11.50				
		6:51	Station completed	57-34,9 N	013-38,8 W	115	250	0.00	1008.20	c	226/17	11.70				
428	15/7/04	8:20	Arrival on station "13966"	57-32,7 N	013-56,8 W	139	250	± 0	1007.80	c/o/p	212/16	11.70				
		8:25	CTD/Ros. to water	57-32,7 N	013-56,8 W	141	242	± 0	1007.80	c/o	211/16	11.40			W 2	Slack with 0,5-1,0m/s
		8:32	Heaving up	57-32,8 N	013-56,9 W	142	252	± 0	1007.80	c/o	222/15	11.50	130	130		Heaving with 0,5-1,0 m/s
		8:39	CTD/Ros. on deck	57-32,9 N	013-56,9 W	142	250	± 0	1007.90	c/o	228/14	11.70				
		9:07	Station completed	57-32,6 N	013-56,7 W	139	230	± 0	1007.60	c/o	222/18	11.50				
429	15/7/04	12:17	Arrival on station "13967"	57-48,8 N	014-29,7 W	346	258	± 0	1006.60	c/o	229/15	10.90				
		12:24	CTD/Ros. to water	57-48,7 N	014-29,9 W	402	250	± 0	1006.60	c/o	223/14	11.00			W 2	Slack with 0,5-1,0m/s
		12:39	Heaving up	57-48,7 N	014-30,1 W	347	251	± 0	1006.50	c/o	228/15	11.70	335	335		Heaving with 0,5-1,0 m/s
		12:56	CTD/Ros. on deck	57-48,7 N	014-30,5 W	352	268	± 0	1006.40	c/o	219/16	11.60				
		12:57	Station completed	57-48,7 N	014-30,6 W	352	268	± 0	1006.40	c/o	219/16	11.60				
430	15/7/04	16:20	Arrival on station "13968"	58-03,1 N	014-59,6 W	562	265	0.00	1004.60	c	223/19	11.60				
		16:23	CTD/Ros. to water	58-03,2 N	014-59,6 W	564	265	0.00	1004.60	c	222/19	11.40			W 2	Slack with 0,5-1,0m/s
		16:35	Heaving up	58-03,3 N	014-59,8 W	563	265	0.00	1004.60	c	223/17	11.70	550	550		Heaving with 0,5-1,0 m/s
		16:56	CTD/Ros. on deck	58-03,5 N	015-00,0 W	560	263	0.00	1004.50	c	226/16	12.30				
		17:20	Station completed	58-03,7 N	015-00,7 W	563	265	0.00	1004.30	c	230/18	12.40				
431	15/7/04	20:05	Arrival on station "13969"	58-17,4 N	015-29,9 W	940	249	± 0	1002.40	c	204/19	11.90				
		20:07	CTD/Ros. to water	58-17,4 N	015-29,9 W	937	254	± 0	1002.40	c	204/19	11.90			W 2	Slack with 0,5-1,0m/s
		20:25	Heaving up	58-17,7 N	015-30,0 W	1012	250	± 0	1002.30	c	220/21	11.80	920	920		Heaving with 0,5-1,0 m/s
		20:49	CTD/Ros. on deck	58-17,9 N	015-30,3 W	n.a.	252	± 0	1002.10	c	242/22	11.40				
		21:13	Station completed	58-16,1 N	015-30,1 W	913	085	8.00	1002.20	c	230/18	11.30				
432	15/7/04	0:04	Arrival on station "13970"	58-30,4 N	015-59,7 W	1162	251	± 0	999.90	c	216/19	12.00				
		0:07	CTD/Ros. to water	58-30,4 N	015-59,7 W	1162	253	± 0	999.80	c	220/23	12.00			W 2	Slack with 0,5-1,0m/s
		0:37	Heaving up	58-30,5 N	015-16,0 W	1189	250	± 0	999.50	c	219/22	11.90	1170	1170		Heaving with 0,5-1,0 m/s
		1:13	CTD/Ros. on deck	58-30,4 N	016-00,2 W	1189	250	± 0	999.20	c	212/16	11.90				
		1:47	Station completed	58-31,3 N	015-56,9 W	1186	037	7.00	999.20	c	208/19	12.90				
433	16/7/04	4:38	Arrival on station "13971"	58-43,9 N	016-30,3 W	1194	255	0.00	997.00	o/c	210/16	11.70				
		4:41	CTD/Ros. to water	58-43,9 N	016-30,3 W	1194	255	0.00	997.00	o/c	210/16	11.70			W 2	Slack with 0,5-1,0m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		5:05	Heaving up	58-44,2 N	016-30,6 W	n.a.	255	0.00	996.40	o/c	214/16	11.80		1180		Heaving with 0,5-1,0 m/s
		5:40	CTD/Ros. on deck	58-44,5 N	016-31,0 W	n.a.	240	0.00	996.10	c	208/15	11.80				
		6:11	Station completed	58-46,8 N	016-26,8 W	1160	050	8.00	996.30	c	220/17	12.00				
434	16/7/04	8:38	Arrival on station "13972"	58-57,6 N	016-58,8 W	1086	250	± 0	995.00	c/o/p	182 18	11.20				
		8:42	CTD/Ros. to water	58-57,6 N	016-58,9 W	1084	251	± 0	994.70	o/c	179/17	10.80			W 2	Slack with 0,5-1,0m/s
		9:00	Heaving up	58-57,8 N	016-59,3 W	1068	248	± 0	994.80	c	179/17	11.40	1060	1060		Heaving with 0,5-1,0 m/s
		9:35	CTD/Ros. on deck	58-58,2 N	016-59,7 W	1048	250	± 0	994.80	c/o	187/15	11.50				
		10:04	Station completed	58-59,6 N	016-55,9 W	1039	30	7.50	994.90	o/p	196/12	11.00				
435	16/7/04	12:26	Arrival on station "13973"	59-09,8 N	017-28,5 W	730	227	± 0	994.00	c	140/13	11.70				
		12:31	CTD/Ros. to water	59-09,8 N	017-28,6 W	733	231	± 0	994.00	c	140/13	11.70			W 2	Slack with 0,5-1,0m/s
		12:52	Heaving up	59-09,8 N	017-28,6 W	735	235	± 0	994.00	c	140/13	11.70		730		Heaving with 0,5-1,0 m/s
		13:18	CTD/Ros. on deck	59-09,7 N	017-28,5 W	734	234	± 0	994.00	c	140/13	11.70				
		13:45	Station completed	59-09,7 N	017-28,5 W	734	234	± 0	994.00	c	140/13	11.70				
436	16/7/04	15:50	Arrival on station "13974"	59-19,9 N	017-48,5 W	1705	080	0.00	994.70	c	060/19	11.60			W 2	
		15:52	CTD/Ros. to water	59-19,9 N	017-48,5 W	1705	080	0.00	994.70	c	060/19	11.60				
		16:23	Heaving up	59-19,8 N	017-47,9 W	1700	075	0.00	995.10	c	055/21	12.10		1693		
		17:06	CTD/Ros. on deck	55-19,9 N	017-47,8 W	1701	080	± 0	995.30	c	038/18	11.50				
		17:10	Station completed	55-19,9 N	017-47,8 W	1700	078	± 0	995.30	c	041/21	11.40				
437	16/7/04	19:14	Arrival on station "13975"	59-29,1 N	018-14,7 W	2461	028	± 0	997.30	c	023/18	12.00			W 2	
		19:22	CTD/Ros. to water	59-29,1 N	018-14,7 W	2461	031	± 0	997.40	c	028/14	12.20				
		20:04	Heaving up	59-29,0 N	018-14,5 W	2448	032	± 0	997.60	c	012/19	12.50	2435	2435		
		20:55	CTD/Ros. on deck	59-28,9 N	018-14,1 W	2429	029	± 0	998.10	c	013/18	12.20				
		21:03	Station completed	59-29,0 N	018-13,9 W	2435	029	5.00	998.00	c	033/20	12.30				
438	16/7/04	23:32	Arrival on station "13976"	59-41,3 N	018-46,4 W	2770	030	± 0	1000.30	c	006/17	12.00			W 2	
		23:33	CTD/Ros. to water	59-41,3 N	018-46,4 W	2770	030	± 0	1000.30	c	006/17	12.00				
		0:23	Heaving up	59-41,2 N	018-45,6 W	2684	033	± 0	1000.50	c	018/16	12.20	2670	2670		
		1:19	CTD/Ros. on deck	59-41,1 N	018-44,7 W	2686	041	± 0	1000.40	c	009/17	12.00				
		2:13	Station completed	59-41,2 N	018-44,3 W	2687	033	± 0	1000.40	c	012/15	12.20				
439	16/7/04	4:19	Arrival on station "13977"	59-53,9 N	019-18,8 W	2687	045	0.00	1001.80	c	015/17	11.90			W 2	Enter EEZ Iceland
		4:20	CTD/Ros. to water	59-53,9 N	019-18,8 W	2686	040	0.00	1001.60	c	007/16	11.80				Slack with 0,5-1,0m/s
		5:03	Heaving up	59-54,0 N	019-17,7 W	2686	040	0.00	1001.80	c	006/15	12.00		2670		Heaving with 0,5-1,0 m/s
		6:12	CTD/Ros. on deck	59-53,9 N	019-16,3 W	2685	035	0.00	1002.10	c	009/17	12.10				
		6:36	Station completed	59-54,4 N	019-16,8 W	2683	345	1.50	1002.30	c	013/18	11.70				
440	17/7/04	8:56	Arrival on station "13999"	60-04,9 N	019-50,6 W	2699	011	± 0	1004.10	c	001/14	11.90				
		8:58	CTD/Ros. to water	60-04,9 N	019-50,6 W	2699	011	± 0	1004.10	c	001/14	11.90			W 2	Slack with 0,5-1,0m/s
		9:42	Heaving up	60-04,6 N	019-50,6 W	2699	012	± 0	1004.20	c	356/13	12.10	2685	2685		Heaving with 0,5-1,0 m/s
		10:35	CTD/Ros. on deck	60-04-9 N	019-50,6 W	2698	012	± 0	1004.50	c	360/11	12.20				
		10:40	Station completed	60-05,0 N	019-50,6 W	2697	352	± 0	1004.50	c	360/11	12.20				
441	17/7/04	15:00	Arrival on station "U"	60-30,0 N	020-00,0 W	2536	348	± 0	1005.00	o/p/d	329/17	11.50				

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		15:20	CTD/Ros. to water	60-30,0 N	020-00,0 W	2536	326	± 0	1005.10	o/d	323/17	11.40			W 2	Slack with 0,5-1,0m/s
		16:01	Heaving up	60-30,0 N	019-59,5 W	2532	340	0.00	1005.00	o/r	323/18	11.10		2525		Heaving with 0,5-1,0 m/s
		16:55	CTD/Ros. on deck	60-30,2 N	019-59,0 W	2530	340	0.00	1005.00	o/r	322/15	10.30				
		17:27	Station completed	60-31,3 N	020-02,6 W	2519	280	5.00	1004.80	o	315/17	11.40				
442	17/4/04	20:49	Arrival on station "V"	61-00,0 N	020-00,0 W	2408	046	± 0	1005.30	c	038/6	11.10				
		20:51	CTD/Ros. to water	61-00,0 N	020-00,0 W	2408	046	± 0	1005.30	c	038/6	11.10			W 2	Slack with 0,5-1,0m/s
		21:30	Heaving up	61-00,1 N	019-59,1 W	2415	030	± 0	1005.40	c	014/8	11.20	2390	2390		Heaving with 0,5-1,0 m/s
		22:21	CTD/Ros. on deck	61-00,2 N	019-58,2 W	2413	37.00	± 0	1005.50	c	021/8	11.30				
		22:29	Station completed	61-00,2 N	019-58,1 W	2414	355	0.50	1005.50	c	021/8	11.30				
443	18/7/04	0:23	Arrival on station "W"	61-15,2 N	020-00,4 W	2380	032	± 0	1005.90	c	027/9	11.30				
		0:30	CTD/Ros. to water	61-15,2 N	020-00,4 W	2388	036	± 0	1005.90	c	028/8	11.40			W 2	Slack with 0,5-1,0m/s
		1:12	Heaving up	61-15,2 N	020-00,1 W	2388	040	± 0	1005.90	c	019/10	11.20	2364	2364		Heaving with 0,5-1,0 m/s
		2:01	CTD/Ros. on deck	61-15,1 N	020-00,0 W	2383	040	± 0	1005.80	c	022/10	11.20				
		2:11	Station completed	61-15,1 N	020-00,0 W	2382	038	± 0	1005.80	c	017/9	11.30				
444	18/7/04	3:54	Arrival on station "X"	61-30,0 N	020-00,1 W	2223	035	0.00	1005.60	c	022/7	11.10				
		3:57	CTD/Ros. to water	61-30,0 N	020-00,1 W	2223	035	0.00	1005.70	c	019/7	11.00			W 2	Slack with 0,5-1,0m/s
		4:34	Heaving up	61-30,1 N	019-59,9 W	2221	035	0.00	1005.60	c	021/6	11.20		2209		Heaving with 0,5-1,0 m/s
		5:20	CTD/Ros. on deck	61-30,3 N	019-59,6 W	2219	035	0.00	1005.70	c	000/7	11.20				
		5:49	Station completed	61-30,6 N	019-59,6 W	2219	010	0.50	1005.80	c	006/6	11.30				
445	18/7/04	7:29	Arrival on station "Xa"	61-45,0 N	020-00,0 W	1804	060	± 0	1006.80	c/o	065/4	11.10				
		7:32	CTD/Ros. to water	61-45,0 N	020-00,0 W	1804	078	± 0	1006.10	c/o	056/4	11.10	1790	1790	W 2	Slack with 0,5-1,0m/s
		8:02	Heaving up	61-45,0 N	020-00,0 W	1804	077	± 0	1006.10	c/o	079/4	11.20				Heaving with 0,5-1,0 m/s
		8:40	CTD/Ros. on deck	61-44,8 N	019-59,8 W	1813	084	± 0	1006.00	c/o	099/4	11.10				
		8:45	Station completed	61-44,9 N	019-59,9 W	1810	002	± 0	1006.00	c/o	099/4	11.10				
446	18/7/04	10:25	Arrival on station "Z"	61-59,9 N	020-00,0 W	1805	164	± 0	1006.30	c	139/3	11.40				
		10:44	CTD/Ros. to water	61-59,9 N	020-00,0 W	1805	155	± 0	1006.30	c	141/3	11.50			W 2	Slack with 0,5-1,0m/s
		11:17	Heaving up	61-59,5 N	020-00,3 W	1806	172	± 0	1006.40	c	170/3	11.50	1790	1790		Heaving with 0,5-1,0 m/s
		12:00	CTD/Ros. on deck	61-59,2 N	020-00,6 W	1807	166	± 0	1006.50	c	160/4	11.80				
		12:03	Station completed	61-59,2 N	020-00,6 W	1807	168	± 0	1006.50	c	157/4	11.70				
447	18/7/04	13:59	Arrival on station "Z 1"	62-15,0 N	019-59,8 W	1820	166	± 0	1006.40	c	175/5	11.60				
		14:01	CTD/Ros. to water	62-15,0 N	019-59,8 W	1820	153	± 0	1006.40	c	175/5	11.80			W 2	Slack with 0,5-1,0m/s
		14:30	Heaving up	62-14,9 N	020-00,1 W	1820	188	± 0	1006.40	c	192/5	11.70	1805	1805		Heaving with 0,5-1,0 m/s
		15:03	CTD/Ros. on deck	62-14,8 N	020-00,5 W	1831	185	± 0	1006.30	c	196/4	12.00				
		15:35	Station completed	62-17,8 N	020-00,2 W	1854	000	6.00	1006.20	c	185/6	12.00				
448	18/7/04	16:59	Arrival on station "Z 2"	62-30,0 N	020-00,0 W	1637	232	± 0	1006.10	c	217/7	11.60				
		17:01	CTD/Ros. to water	62-30,0 N	020-00,0 W	1637	232	± 0	1006.10	c	217/6	11.60			W 2	Slack with 0,5-1,0m/s
		17:26	Heaving up	62-30,0 N	020-00,1 W	1637	230	0.00	1006.80	b	221/7	11.90		1622		Heaving with 0,5-1,0 m/s
		18:06	CTD/Ros. on deck	62-29,9 N	020-00,3 W	1634	235	0.00	1005.90	b/c	220/7	12.00				
		18:23	Station completed	62-31,4 N	020-00,3 W	1616	000	5.00	1005.90	b/c	212/8	11.90				

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
449	18/7/04	20:01	Arrival on station "Z 21"	62-45,0 N	020-00,0 W	1420	240	± 0	1005.70	b/c	245/7	11.70			W 2	
		20:02	CTD/Ros. to water	62-45,0 N	020-00,0 W	1420	240	± 0	1005.70	b/c	245/7	11.70				Slack with 0,5-1,0m/s
		20:27	Heaving up	62-45,0 N	020-00,4 W	1417	254	± 0	1005.70	b/c	245/8	11.80	1400	1405		Heaving with 0,5-1,0 m/s
		20:57	CTD/Ros. on deck	62-45,0 N	020-01,0 W	1413	255	± 0	1005.70	b/c	244/7	11.80				
		21:26	Station completed	62-48,5 N	020-0,9 W	1368	003	9.60	1005.70	b/c	253/9	11.70				
450	18/7/04	22:42	Arrival on station "Z 3"	63-00,0 N	019-59,5 W	1148	236	± 0	1005.40	b/c	241/9	11.50			W 2	
		22:46	CTD/Ros. to water	62-59,9 N	019-59,5 W	1154	236	± 0	1005.40	b/c	241/9	11.50				Slack with 0,5-1,0m/s
		23:10	Heaving up	62-59,9 N	019-59,7 W	1155	257	± 0	1005.30	b/c	236/9	11.40	1145	1145		Heaving with 0,5-1,0 m/s
		23:34	CTD/Ros. on deck	62-59,9 N	020-00,0 W	1172	249	± 0	1005.30	b/c	239/10	11.30				
		23:37	Station completed	62-59,9 N	020-00,1 W	1178	251	± 0	1005.30	b/c	238/11	11.50				
		1:27	Bottle to water	63-14,2 N	019-59,9 W	340	355	2.10	1005.30	b/c	240/11	11.60				Taken sample fm surface by bottle on rod
451	19/7/04	1:37	Arrival on station "500 m"	63-15,0 N	019-59,8 W	320	279	± 0	1004.80	b/c	242/12	11.60				
		1:38	CTD/Ros. to water	63-15,0 N	019-59,8 W	316	277	± 0	1004.80	b/c	242/12	11.60			W 2	Slack with 0,5-1,0m/s
		1:51	Heaving up	63-15,1 N	019-59,9 W	299	252	± 0	1004.70	b/c	243/12	11.30	298	298		Heaving with 0,5-1,0 m/s
		2:06	CTD/Ros. on deck	63-15,2 N	020-00,1 W	274	259	± 0	1004.70	b/c	240/12	11.20				
		2:09	Station completed	63-15,2 N	020-00,1 W	257	319	± 0	1004.70	b/c	227/13	11.60				
452	19/7/04	2:36	Arrival on station "Z 4"	63-17,9 N	019-59,9 W	199	360	± 0	1004.50	b/c	245/11	11.20				
		2:38	CTD/Ros. to water	63-18,0 N	020-00,0 W	199	322	± 0	1004.50	b/c	247/11	11.50			W 2	Slack with 0,5-1,0m/s
		2:50	Heaving up	63-18,1 N	020-00,1 W	196	335	± 0	1004.50	b/c	253/12	11.20	191	191		Heaving with 0,5-1,0 m/s
		3:00	CTD/Ros. on deck	63-18,2 N	020-00,2 W	195	341	± 0	1004.40	b/c	255/11	11.00				
		3:33	Station completed	63-15,6 N	020-00,6 W	240	185	6.00	1004.10	b/c	253/8	11.30				
453	19/7/04	21:35	Arrival on station "13998"	60-22,6 N	020-34,8 W	2642	256	± 0	1004.70	c/o	247/8	11.60			W 2	
		21:37	CTD/Ros. to water	60-22,6 N	020-34,8 W	2642	256	± 0	1004.70	o/c	247/8	11.60				Slack with 0,5-1,0m/s
		22:20	Heaving up	60-22,4 N	020-35,3 W	2645	261	± 0	1004.70	o/c	257/6	11.50	2625	2632		Heaving with 0,5-1,0 m/s
		23:11	CTD/Ros. on deck	60-22,2 N	020-35,9 W	2646	280	± 0	1004.50	o/c	235/7	11.40				drfting ~230° - ,5 knts
		23:17	Bottle to water	60-22,1 N	020-36,2 W	2647	280	1.00	1004.50	o/c	237/7	11.70				Taken sample fm surface by bottle on rod
		23:20	Station completed	60-22,1 N	020-36,3 W	2647	280	± 0	1004.50	o/c	238/7	11.70				wind veering more westerly
454	20/7/04	2:29	Arrival on station "13997"	60-39,1 N	021-19,3 W	2448	242	0.00	1003.20	o/c	225/6	11.30			W 2	
		2:30	CTD/Ros. to water	60-39,1 N	021-19,3 W	2448	242	0.00	1003.20	o/c	225/6	11.30				Slack with 0,5-1,0m/s
		3:09	Heaving up	60-39,1 N	021-19,3 W	2449	240	0.00	1002.90	o/c	181/8	11.10		2400		Heaving with 0,5-1,0 m/s
		4:02	CTD/Ros. on deck	60-39,1 N	021-19,4 W	2448	240	0.00	1002.60	o/c	219/6	10.60				
		4:33	Station completed	60-38,9 N	021-20,1 W	2450	240	0.50	1002.50	o/c	213/3	10.50				
455	20/7/04	7:36	Arrival on station "13996"	60-55,0 N	022-07,5 W	2132	118	± 0	1001.90	o/c	120/4	9.80			W 2	
		7:38	CTD/Ros. to water	60-55,0 N	022-07,4 W	2132	130	± 0	1001.90	o/c	118/43	9.80				Slack with 0,5-1,0m/s
		8:11	Heaving up	60-55,2 N	022-06,7 W	2133	091	± 0	1001.70	o/c	079/3	10.50	2125	2125		Heaving with 0,5-1,0 m/s
		8:53	CTD/Ros. on deck	60-55,4 N	022-06,3 W	2132	353	± 0	1001.70	o/c	102/11	10.30				drifting ~80° - 0,8 knts
		9:23	Station completed	60-57,2 N	022-12,5 W	2080	302	9.50	1001.70	o/c	117/7	10.40				
456	20/7/04	11:33	Arrival on station "13995"	61-05,2 N	022-39,9 W	1877	105	± 0	1001.60	o/c	101/10	10.60			W 2	
		11:34	CTD/Ros. to water	61-05,2 N	022-39,9 W	1874	105	± 0	1001.60	o/c	101/10	10.60				Slack with 0,5-1,0m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		12:08	Heaving up	61-05,0 N	022-39,6 W	1871	112	± 0	1001.80	o/c	102/9	11.30	1858	1858		Heaving with 0,5-1,0 m/s
		12:48	CTD/Ros. on deck	61-04,9 N	022-39,5 W	1872	131	± 0	1001.90	o/c	084/10	11.40				
		12:58	Bottle to water	61-04,9 N	022-39,3 W	1871	077	1.10	1002.00	o/c	085/11	11.80				Taken pole sample
		13:00	Station completed	61-04,9 N	022-39,2 W	1871	077	± 0	1001.90	o/c	090/12	11.40				
457	38188	14:36	Arrival on station "13994"	61-11,6 N	022-56,8 W	1909	109	0.00	1002.30	o/c	091/12	11.50			W 2	
		14:37	CTD/Ros. to water	61-11,6 N	022-56,8 W	1909	109	0.00	1002.30	o/c	091/12	11.50				Slack with 0,5-1,0m/s
		15:15	Heaving up	61-11,6 N	022-56,5 W	1911	100	0.00	1002.40	o/c	079/11	11.80		1891		Heaving with 0,5-1,0 m/s
		15:59	CTD/Ros. on deck	61-11,6 N	022-56,2 W	1910	100	0.00	1002.40	o/c	076/11	12.00				
		16:02	Bottle to water	61-11,5 N	022-56,0 W	1910	100	1.00	1002.40	o/c	076/11	12.00				Taken sample fm surface by bottle on rod
		16:37	Station completed	61-13,2 N	023-01,9 W	1900	300	5.80	1002.50	c	079/12	11.80				
458	20/7/04	18:00	Arrival on station "13993a"	61-19,4 N	023-23,7 W	1851	080	0.00	1003.00	c	055/10	11.70			W 2	
		18:03	CTD/Ros. to water	61-19,4 N	023-23,7 W	1851	080	0.00	1003.10	c	059/11	11.80				Slack with 0,5-1,0m/s
		18:33	Heaving up	61-19,4 N	023-23,3 W	1854	080	0.00	1003.20	b/c	061/12	11.80		1840		Heaving with 0,5-1,0 m/s
		19:15	CTD/Ros. on deck	61-19,3 N	023-22,8 W	1856	080	± 0	1003.50	b/c	048/12	11.80				
		19:32	Station completed	61-19,6 N	023-22,5 W	1850	303	7.40	1003.50	b/c	050/12	11.80				Surface sample taken @ 1 knts speed
459	20/7/04	22:03	Arrival on station "13993"	61-27,6 N	023-48,7 W	1777	069	± 0	1005.10	b/c	049/16	12.40			W 2	
		22:05	CTD/Ros. to water	61-27,6 N	023-48,7 W	1776	067	± 0	1005.20	b/c	044/13	12.00				Slack with 0,5-1,0m/s
		22:35	Heaving up	61-27,3 N	023-49,1 W	1766	065	± 0	1005.40	b/c	047/14	12.10	1750	1750		Heaving with 0,5-1,0 m/s
		23:13	CTD/Ros. on deck	61-27,1 N	023-49,0 W	1776	066	± 0	1005.70	b/c	027/16	11.80				drifting ~200° - 06 knts
		23:20	Bottle to water	61-27,2 N	023-49,0 W	1777	013	1.00	1005.70	b/c	031/16	11.90				Taken pole sample
		23:26	Bottle to water	61-27,3 N	023-49,1 W	1768	044	1.00	1005.80	b/c	033/16	12.10				Taken pole sample
		23:27	Station completed	61-27,3 N	023-49,1 W	1766	045	± 0	1005.80	b/c	033/16	12.10				Surface sample taken @ 1 knts speed
460	21/7/04	3:00	Arrival on station "13992"	61-43,9 N	024-40,8 W	1390	032	0.00	1007.40	b/c	023/10	11.20				
		3:01	CTD/Ros. to water	61-43,9 N	024-40,8 W	1390	032	0.00	1007.40	b/c	023/10	11.20			W 2	Slack with 0,5-1,0m/s
		3:33	Heaving up	61-43,9 N	024-39,9 W	1448	045	0.00	1007.50	b/c	026/11	11.40		1450		Heaving with 0,5-1,0 m/s
		4:09	CTD/Ros. on deck	61-43,8 N	024-39,0 W	1424	045	0.00	1007.80	b/c	021/9	11.10				
		4:42	Station completed	61-45,7 N	024-43,8 W	1464	300	5.80	1007.80	b/c	023/17	11.00				
461	21/7/04	6:04	Arrival on station "13991a"	61-51,2 N	025-04,2 W	1434	045	0.00	1008.90	b/c	022/14	10.60				
		6:06	CTD/Ros. to water	61-51,2 N	025-04,2 W	1432	045	0.00	1008.90	b/c	023/14	10.80			W 2	Slack with 0,5-1,0m/s
		6:33	Heaving up	61-50,9 N	025-03,8 W	1445	045	0.00	1009.10	b/c	024/14	10.80		1430		Heaving with 0,5-1,0 m/s
		7:05	CTD/Ros. on deck	61-50,6 N	025-03,4 W	1445	045	± 0	1009.50	c	025/12	10.70				
		7:38	Station completed	61-52,6 N	025-08,8 W	1385	302	9.60	1009.60	c	025/12	10.70				
462	21/7/04	9:00	Arrival on station "13991"	61-59,3 N	025-30,3 W	1269	028	± 0	1010.20	c/o	345/13	10.50			W 2	
		9:03	CTD/Ros. to water	61-59,3 N	025-30,3 W	1270	029	± 0	1010.30	c/o	348/13	10.50				Slack with 0,5-1,0m/s
		9:25	Heaving up	61-59,3 N	025-30,0 W	1302	026	± 0	1010.40	c/o	355/12	10.00	1270	1270		Heaving with 0,5-1,0 m/s
		9:55	CTD/Ros. on deck	61-59,3 N	025-29,8 W	1424	021	± 0	1010.50	c/o	354/11	10.20				
		10:23	Station completed	62-01,1 N	025-36,0 W	1350	303	9.50	1010.60	c/o	354/13	10.00				
463	21/7/04	11:13	Arrival on station "3"	62-04,3 N	025-49,0 W	704	021	± 0	1011.10	c/o	344/8	9.80			W 2	
		11:13	CTD/Ros. to water	62-04,3 N	025-48,9 W	707	021	± 0	1011.20	c/o	344/8	9.80				Slack with 0,5-1,0m/s

Cruise: PO 314 **Stationwork**

Principal Scientist: Dr. Jane Read Stations Total: 75

Statio	Date	Time	Description	LAT	LONG	WD	course	v	Press.	Wea-	Wind	Air temp	Wire Length		Winch	Remarks
No.		UTC				m	°	kn	hPa	ther	deg/knts	°C	m	max m		
		11:34	Heaving up	62-04,5 N	025-48,9 W	696	358	± 0	1011.20	c/o	347/8	10.00	685	685		Heaving with 0,5-1,0 m/s
		11:57	CTD/Ros. on deck	62-04,6 N	025-48,9 W	712	080	± 0	1011.30	c/o	341/8	9.80				
		11:58	Station completed	62-04,6 N	025-48,9 W	713	080	± 0	1011.30	c/o	348/9	10.00				
464	21/7/04	13:15	Arrival on station "4"	62-08,9 N	026-05,7 W	721	337	± 0	1011.60	c/o	345/8	9.90			W 2	
		13:15	CTD/Ros. to water	62-08,9 N	026-05,7 W	721	337	± 0	1011.70	c/o	345/8	9.90				Slack with 0,5-1,0m/s
		13:34	Heaving up	62-08,9 N	026-05,8 W	716	342	± 0	1011.80	c/o	326/10	9.70	710	710		Heaving with 0,5-1,0 m/s
		14:00	CTD/Ros. on deck	62-08,9 N	026-05,8 W	714	342	± 0	1012.00	c/o	328/10	9.70				
		14:02	Station completed	62-09,0 N	026-05,8 W	713	338	± 0	1012.00	c/o	335/9	9.60				
465	21/7/04	15:10	Arrival on station "5"	62-13,8 N	026-22,7 W	1038	000	0.00	1012.10	c/o	332/7	9.60				
		15:14	CTD/Ros. to water	62-13,8 N	026-22,6 W	1037	000	0.00	1012.20	c/o	326/8	9.50			W 2	Slack with 0,5-1,0m/s
		15:33	Heaving up	62-13,9 N	026-22,3 W	1032	000	0.00	1012.10	c/o	331/7	9.60		1025		Heaving with 0,5-1,0 m/s
		16:00	CTD/Ros. on deck	62-14,0 N	026-21,7 W	1027	000	0.00	1012.20	c/o	330/8	9.60				
		16:30	Station completed	62-14,4 N	026-23,3 W	996	310	0.00	1012.10	c/o	349/10	9.80				
466	21/7/04	17:52	Arrival on station "6"	62-20,1 N	026-45,6 W	1496	010	0.00	1012.10	c/o	349/4	9.70				
		17:54	CTD/Ros. to water	62-20,1 N	026-45,6 W	1497	010	0.00	1012.10	c/o	351/4	9.60			W 2	Slack with 0,5-1,0m/s
		18:20	Heaving up	62-20,3 N	026-45,5 W	1497	010	0.00	1012.20	c/o	347/4	9.70		1480		Heaving with 0,5-1,0 m/s
		18:58	CTD/Ros. on deck	62-20,4 N	026-45,3 W	1498	010	0.00	1012.60	c/o	349/6	9.70				
		19:42	Station completed	62-23,2 N	026-56,5 W	1459	299	9.50	1012.60	c/o	328/9	9.30				
467	21/7/04	21:11	Arrival on station "7"	62-29,4 N	027-20,0 W	1444	024	± 0	1012.80	o/c	351/11	9.80			W 2	
		21:13	CTD/Ros. to water	62-29,4 N	027-20,0 W	1445	025	± 0	1012.90	o	012/9	9.80				Slack with 0,5-1,0m/s
		21:36	Heaving up	62-29,4 N	027-19,8 W	1441	030	± 0	1012.80	o	021/13	9.10	1425	1425		Heaving with 0,5-1,0 m/s
		22:05	CTD/Ros. on deck	62-29,4 N	027-19,5 W	1434	032	± 0	1013.00	o	007/9	9.30				drifting ~100° - 0,4 knts
		22:32	Station completed	62-31,2 N	027-26,1 W	1472	300	9.50	1013.00	o	006/12	9.60				
468	22/7/04	0:24	Arrival on station "8"	62-38,6 N	027-55,4 W	1377	019	± 0	1013.60	b/c	359/6	9.50			W 2	
		0:24	CTD/Ros. to water	62-38,6 N	027-55,4 W	1377	019	± 0	1013.60	b/c	359/6	9.50				Slack with 0,5-1,0m/s
		0:53	Heaving up	62-38,7 N	027-54,9 W	1352	039	± 0	1013.50	b/c	002/7	9.50	1345	1345		Heaving with 0,5-1,0 m/s
		1:27	CTD/Ros. on deck	62-38,6 N	027-54,4 W	1331	028	± 0	1013.40	b/c	341/4	9.40				
		1:27	Station completed	62-38,6 N	027-54,4 W	1331	028	± 0	1013.40	b/c	341/4	9.80				
469	22/7/04	3:40	Arrival on station "9"	62-47,6 N	028-30,5 W	1851	015	0.00	1013.10	o/c	Light Air	9.10				
		3:43	CTD/Ros. to water	62-47,7 N	028-30,4 W	1852	015	0.00	1013.10	o/c	Light Air	9.00			W 2	Slack with 0,5-1,0m/s
		4:15	Heaving up	62-47,9 N	028-30,1 W	1852	015	0.00	1012.80	o/c	Light Air	8.70		1833		Heaving with 0,5-1,0 m/s
		4:57	CTD/Ros. on deck	62-48,0 N	028-29,7 W	1851	015	0.00	1012.60	o/c	Light Air	8.80				
		4:58	Station completed	62-48,0 N	028-29,7 W	1851	015	0.00	1012.60	o/c	Light Air	8.80				
470	22/7/04	7:08	Arrival on station "10"	62-56,5 N	029-06,0 W	1721	332	± 0	1012.30	o	213/6	8.60			W 2	
		7:10	CTD/Ros. to water	62-56,5 N	029-06,0 W	1721	332	± 0	1012.30	o	213/6	8.60				Slack with 0,5-1,0m/s
		7:37	Heaving up	62-56,7 N	029-05,8 W	1728	316	± 0	1012.30	o	254/4	8.50	1710	1710		Heaving with 0,5-1,0 m/s
		8:12	CTD/Ros. on deck	62-56,9 N	029-05,4 W	1725	319	± 0	1012.20	o	248/5	8.20				
		8:43	Station completed	62-58,8 N	029-56,2 W	1863	065	9.90	1012.00	o	234/5	8.40				
		8:45	**End of scientific research program, resume voyage to Reykjavik**													

APPENDIX 4 i. CTD configuration files

Appendix 4 i a. Configuration File PD314_03_nofluor.con for CTD station 396-402

```
Date: 07/12/2004

ASCII file: C:\Programme\Sea-Bird\Seasave-Win32\PD314_03_nofluor.con

Configuration report for SBE 911/917 plus CTD
---------------------------------------------

Frequency channels suppressed : 2
Voltage words suppressed      : 3
Computer interface            : RS-232C
Scans to average              : 1
Surface PAR voltage added     : No
NMEA position data added      : No
Scan time added               : No

1) Frequency, Temperature

   Serial number : 03P-4051
   Calibrated on : 12 January 2001
   G             : 4.34730944e-003
   H             : 6.40964959e-004
   I             : 2.20586610e-005
   J             : 1.91011023e-006
   F0            : 1000.000
   Slope         : 1.00000000
   Offset        : 0.0000

2) Frequency, Conductivity

   Serial number : 04C-2537
   Calibrated on : 30 January 2001
   G             : -1.03427848e+001
   H             : 1.60944455e+000
   I             : -1.42067786e-003
   J             : 2.08757234e-004
   CTcor         : 3.2500e-006
   CPcor         : -9.57000000e-008
   Slope         : 1.00000000
   Offset        : 0.00000

3) Frequency, Pressure, Digiquartz with TC

   Serial number : 82991
   Calibrated on : 18 December 2000
   C1            : -4.078134e+004
   C2            : -4.747219e-001
   C3            : 1.048620e-002
   D1            : 3.198100e-002
   D2            : 0.000000e+000
   T1            : 3.016830e+001
   T2            : -3.816546e-004
   T3            : 3.229140e-006
   T4            : 4.708030e-009
   T5            : 0.000000e+000
   Slope         : 1.00000000
   Offset        : 0.00000
   AD590M        : 1.280400e-002
   AD590B        : -8.709539e+000
```

4) A/D voltage 0, Oxygen Temperature, Beckman/YSI

Serial number	: 13B-0555
Calibrated on	: 6 May 2000
K	: 8.9168
C	: -6.9820

5) A/D voltage 1, Oxygen Current, Beckman/YSI

Serial number	: 13B-0555
Calibrated on	: 6 May 2000
M	: 2.4448e-007
B	: -3.9679e-010
Soc	: 2.7800
Boc	: -0.0084
Tcor	: -0.0330
Pcor	: 1.50e+000
Tau	: 2.0
Wt	: 0.67

Appendix 4 i b. Configuration File PD314_03_nofluor_43oxy.con for CTD stations 403

```
Date: 07/13/2004

ASCII file: C:\Programme\Sea-Bird\Seasave-
Win32\PD314_03_nofluor_43oxy.con

Configuration report for SBE 911/917 plus CTD
---------------------------------------------

Frequency channels suppressed : 2
Voltage words suppressed      : 3
Computer interface            : RS-232C
Scans to average              : 1
Surface PAR voltage added     : No
NMEA position data added      : No
Scan time added               : No

1) Frequency, Temperature

   Serial number : 03P-4051
   Calibrated on : 12 January 2001
   G             : 4.34730944e-003
   H             : 6.40964959e-004
   I             : 2.20586610e-005
   J             : 1.91011023e-006
   F0            : 1000.000
   Slope         : 1.00000000
   Offset        : 0.0000

2) Frequency, Conductivity

   Serial number : 04C-2537
   Calibrated on : 30 January 2001
   G             : -1.03427848e+001
   H             : 1.60944455e+000
   I             : -1.42067786e-003
   J             : 2.08757234e-004
   CTcor         : 3.2500e-006
   CPcor         : -9.57000000e-008
   Slope         : 1.00000000
   Offset        : 0.00000

3) Frequency, Pressure, Digiquartz with TC

   Serial number : 82991
   Calibrated on : 18 December 2000
   C1            : -4.078134e+004
   C2            : -4.747219e-001
   C3            : 1.048620e-002
   D1            : 3.198100e-002
   D2            : 0.000000e+000
   T1            : 3.016830e+001
   T2            : -3.816546e-004
   T3            : 3.229140e-006
   T4            : 4.708030e-009
   T5            : 0.000000e+000
   Slope         : 1.00000000
   Offset        : 0.00000
   AD590M        : 1.280400e-002
   AD590B        : -8.709539e+000
```

4) A/D voltage 0, Oxygen, SBE 43

Serial number	: 43-0631
Calibrated on	: 31 January 2004
Soc	: 4.0060e-001
Boc	: 0.0000
Offset	: -0.5104
Tcor	: 0.0008
Pcor	: 1.35e-004
Tau	: 0.0

5) A/D voltage 1, Free

Appendix 4 i c. Configuration File PD314_03_43oxy.con for CTD stations 404-470

```
Date: 07/13/2004

ASCII file: C:\Programme\Sea-Bird\Seasave-Win32\PD314_03_43oxy.con

Configuration report for SBE 911/917 plus CTD
---------------------------------------------

Frequency channels suppressed : 2
Voltage words suppressed      : 2
Computer interface            : RS-232C
Scans to average              : 1
Surface PAR voltage added     : No
NMEA position data added      : No
Scan time added               : No

1) Frequency, Temperature

   Serial number : 03P-4051
   Calibrated on : 12 January 2001
   G             : 4.34730944e-003
   H             : 6.40964959e-004
   I             : 2.20586610e-005
   J             : 1.91011023e-006
   F0            : 1000.000
   Slope         : 1.00000000
   Offset        : 0.0000

2) Frequency, Conductivity

   Serial number : 04C-2537
   Calibrated on : 30 January 2001
   G             : -1.03427848e+001
   H             : 1.60944455e+000
   I             : -1.42067786e-003
   J             : 2.08757234e-004
   CTcor         : 3.2500e-006
   CPcor         : -9.57000000e-008
   Slope         : 1.00000000
   Offset        : 0.00000

3) Frequency, Pressure, Digiquartz with TC

   Serial number : 82991
   Calibrated on : 18 December 2000
   C1            : -4.078134e+004
   C2            : -4.747219e-001
   C3            : 1.048620e-002
   D1            : 3.198100e-002
   D2            : 0.000000e+000
   T1            : 3.016830e+001
   T2            : -3.816546e-004
   T3            : 3.229140e-006
   T4            : 4.708030e-009
   T5            : 0.000000e+000
   Slope         : 1.00000000
   Offset        : 0.00000
   AD590M        : 1.280400e-002
   AD590B        : -8.709539e+000

4) A/D voltage 0, Oxygen, SBE 43
```

```
   Serial number : 43-0631
   Calibrated on : 31 January 2004
   Soc           : 4.0060e-001
   Boc           : 0.0000
   Offset        : -0.5104
   Tcor          : 0.0008
   Pcor          : 1.35e-004
   Tau           : 0.0

5) A/D voltage 1, Free

6) A/D voltage 2, Fluorometer, Dr. Haardt Chlorophyll a

   Serial number     : 14010
   Calibrated on     :
   Gain range switch : None
   A0                : 0.00000000
   A1                : 1.00000000
   B0                : 0.00000000
   B1                : 1.00000000

7) A/D voltage 3, Free
```

APPENDIX 4 ii. Configuration Files for the Lowered ADCP

Master downward looking LADCP file whm314.cmd

```
PS0
CR1
CF11101
EA00000
EB00000
ED00000
ES35
EX11111
EZ0111111
TE00:00:01.00
TP00:01.00
LD111100000
LF0500
LN016
LP00001
LS1000
LV250
LJ1
LW1
LZ30,220
SM1
SA001
SW05000
CK
CS
```

Slave, upward looking LADCP file whs.cmd

```
PS0
CR1
CF11101
EA00000
EB00000
ED00000
ES35
EX11111
EZ0111111
TE00:00:01.00
TP00:01.00
LD111100000
LF0500
LN016
LP00001
LS1000
LV250
LJ1
LW1
LZ30,220
SM2
SA001
ST0
CK
CS
```

APPENDIX 4 iii. Configuration File for the Vessel Mounted ADCP

```
AD,SI,HUNDREDTHS    120.00 Sampling interval
AD,NB,WHOLE             64 Number of Depth Bins
AD,BL,WHOLE              3 Bin Length
AD,PL,WHOLE              8 Pulse Length
AD,BK,TENTHS           8.0 Blank Beyond Transmit
AD,PE,WHOLE              1 Pings Per Ensemble
AD,PC,HUNDREDTHS      1.00 Pulse Cycle Time
AD,PG,WHOLE             25 Percent Pings Good Threshold
XX,OD2,WHOLE             5 [SYSTEM DEFAULT, OD2]
XX,TE,HUNDREDTHS      0.00 [SYSTEM DEFAULT, TE]
AD,US,BOOLE              NO  Use Direct Commands on StartUp
DP,TR,BOOLE              NO  Toggle roll compensation
DP,TP,BOOLE              NO  Toggle Pitch compensation
DP,TH,BOOLE             YES  Toggle  compensation
DP,VS,BOOLE             YES  Calculate Sound Velocity from
TEMP/Salinity
DP,UR,BOOLE              NO  Use Reference Layer
DP,FR,WHOLE              6 First Bin for reference Layer
DP,LR,WHOLE             15 Last Bin for reference Layer
DP,BT,BOOLE             YES  Use Bottom Track
DP,B3,BOOLE              NO  Use 3 Beam Solutions
DP,EV,BOOLE             YES  Use Error Velocity as Percent Good
Criterion
DP,ME,TENTHS          100.0 Max. Error Velocity for Valid Data
(cm/sec)
DR,RD,BOOLE             YES  Recording on disk
DR,RX,BOOLE             YES  Record N/S (FORE/AFT) Vel.
DR,RY,BOOLE             YES  Record E/W (FORT/STBD) Vel.
DR,RZ,BOOLE             YES  Record vertical vel.
DR,RE,BOOLE             YES  Record error Good
DR,RB,BOOLE              NO  Bytes of user prog. buffer
DR,RP,BOOLE             YES  Record Percent good
DR,RA,BOOLE             YES  Record average AGC/Bin
DR,RN,BOOLE             YES  Record Ancillary data
DR,AP,BOOLE             YES  Auto-ping on start-up
XX,LDR,TRI                4 [SYSTEM DEFAULT, LDR]
XX,RB2,WHOLE            192 [SYSTEM DEFAULT, RB2]
DR,RC,BOOLE              NO  Record CTD data
XX,FB,WHOLE               1 [SYSTEM DEFAULT, FB]
XX,PU,BOOLE              NO  [SYSTEM DEFAULT, PU]
GC,TG,TRI                 1 DISPLAY (NO/GRAPH/TAB)
GC,ZV,WHOLE               4 ZERO VELOCITY REFERENCE (S/B/M/L)
GC,VL,WHOLE            -200 LOWEST VELOCITY ON GRAPH
CG,VH,WHOLE             200 HIGHEST VELOCITY ON GRAPH
GC,DL,WHOLE               0 LOWEST DEPTHS ON GRAPH
GC,DH,WHOLE             400 HIGHEST DEPTHS ON GRAPH
GC,SW,BOOLE              NO  SET DEPTHS WINDOW TO INCLUDE ALL BINS
GC,MP,WHOLE              25 MINIMUM PERCENT GOOD TO PLOT
SG,PNS,BOOLE            YES  PLOT NORTH/SOUTH VEL.
SG,PEW,BOOLE            YES  PLOT EAST/WEST VEL.
SG,PVT,BOOLE            YES  PLOT VERTICAL VEL.
SG,PEV,BOOLE            YES  PLOT ERROR VEL.
SG,PPE,BOOLE             NO  PLOT PERCENT ERROR
SG,PMD,BOOLE             NO  PLOT MAG AND DIR
SG,PSW,BOOLE             NO  PLOT AVERAGE SP. W.
SG,PAV,BOOLE            YES  PLOT AVERAGE AGC.
SG,PPG,BOOLE            YES  PLOT PERCENT GOOD
SG,PD1,BOOLE             NO  PLOT DOPPLER 1
SG,PD2,BOOLE             NO  PLOT DOPPLER 2
SG,PD3,BOOLE             NO  PLOT DOPPLER 3
```

```
SG,PD4,BOOLE            NO  PLOT DOPPLER 4
SG,PW1,BOOLE            NO  PLOT SP. W. 1
SG,PW2,BOOLE            NO  PLOT SP. W. 2
SG,PW3,BOOLE            NO  PLOT SP. W. 3
SG,PW4,BOOLE            NO  PLOT SP. W. 4
SG,PA1,BOOLE            NO  PLOT AGC 1
SG,PA2,BOOLE            NO  PLOT AGC 2
SG,PA3,BOOLE            NO  PLOT AGC 3
SG,PA4,BOOLE            NO  PLOT AGC 4
SG,PP3,BOOLE            NO  PLOT 3-BEAM SOLUTION
SS,OD,WHOLE              4 OffSet for Depth
SS,OH,TENTHS           0.0 OffSet for Heading
SS,OP,TENTHS           0.0 OffSet for Pitch
SS,ZR,TENTHS           0.0 OffSet for Roll
SS,OT,HUNDREDTHS     45.00 OffSet FOR temp
SS,ST,HUNDREDTHS     50.00 Scale for Temp
SS,SL,HUNDREDTHS     35.00 Salinity (PPT)
SS,UD,BOOLE            YES  Toggle UP/DOWN
SS,CV,BOOLE             NO  Toggle concave/Convex  transducerhead
SS,MA,TENTHS          30.0 Mounting angle for transducers.
SS,SS,HUNDREDTHS   1500.00 Speed of Sound (m/sec)
XX,GP,BOOLE            YES  [SYSTEM DEFAULT, GP]
XX,DD,TENTHS           1.0 [SYSTEM DEFAULT, DD]
XX,PT,BOOLE             NO  [SYSTEM DEFAULT, PT]
XX,TU,TRI                1 [SYSTEM DEFAULT, TU]
TB,FP,WHOLE              1 FIRST BINS TO PRINT
TB,LP,WHOLE             64 LAST BIN TO PRINT
TB,SK,WHOLE              6 SKIP INTERVAL BETWEEN BINS
TB,DT,BOOLE            YES  DIAGNOSTIC TAB MODE
DU,TD,BOOLE             NO  TOGGLE USE OF DUMMY DATA
XX,PN,WHOLE             43 [SYSTEM DEFAULT, PN]
DR,SD,WHOLE              3 Second recording drive
DR,PD,WHOLE              4 First recording drive (1=A:,2=B: ... )
DP,PX,BOOLE             NO  Profiler does XYZE transform
SS,LC,TENTHS           5.0 Limit of Knots change
SS,NW,TENTHS           0.5 Weight of new knots of value
GC,GM,TRI                2 GRAPHICS CONTROL 0=LO RES, 1=HI RES,
2=ENHANCED
AD,PS,BOOLE             NO  YES=SERIAL/NO=PARALLEL Profiler Link
XX,LNN,BOOLE           YES  [SYSTEM DEFAULT, LNN]
XX,BM,BOOLE            YES  [SYSTEM DEFAULT, BM]
XX,RSD,BOOLE            NO  RECORD STANDARD DEVIATION OF VELOCITIES
PER BIN
XX,DRV,WHOLE             3 [SYSTEM DEFAULT, DRV]
XX,PBD,WHOLE             4 [SYSTEM DEFAULT, PBD]
TB,RS,BOOLE             NO  SHOW RHPT STATISTIC
UX,EE,BOOLE            YES  ENABLE EXIT TO EXTERNAL PROGRAM
SS,VSC,TRI               0 Velocity scale adjustment
AD,DM,BOOLE             NO  USE DMA
TB,SC,BOOLE             NO  SHOW CTD DATA
AD,CW,BOOLE             NO  Collect spectral width
DR,RW,BOOLE             NO  Record average SP.W./Bin
DR,RRD,BOOLE            NO  Record last raw dopplers
DR,RRA,BOOLE           YES  Record last raw AGC
DR,RRW,BOOLE            NO  Record last SP.W.
DR,R3,BOOLE             NO  Record average 3-Beam solutions
DR,RBS,BOOLE           YES  Record beam statistic
XX,STD,BOOLE            NO  [SYSTEM DEFAULT, STD]
LR,HB,HUNDREDTHS      0.00 Heading Bias
SL,1,ARRAY5      0     1     8    NONE  9600  PROFILER
SL,2,ARRAY5      0     1     8    NONE  1200  LORAN RECEIVER
SL,3,ARRAY5      0     1     8    NONE  1200  REMOTE DISPLAY
SL,4,ARRAY5      0     1     8    NONE  9600  ENSEMBLE OUTPUT
```

```
SL,5,ARRAY5      0     1     8    NONE  1200  COM1:
SL,6,ARRAY5      0     1     8    NONE  1200  COM2:
DU,1,ARRAY6     100.00    100.00     60.00      0.00      0.00 YES D1
DU,2,ARRAY6    -100.00   -100.00     60.00      0.00      0.00 YES D2
DU,3,ARRAY6     200.00    200.00     60.00      0.00      0.00 YES D3
DU,4,ARRAY6    -200.00   -200.00     60.00      0.00      0.00 YES D4
DU,5,ARRAY6     200.00     19.00     60.00      0.00      0.00 YES
AGC
DU,6,ARRAY6       0.00      0.00     60.00      0.00      0.00 NO
SP. W.
DU,7,ARRAY6       0.00      0.00     60.00      0.00      0.00 NO
ROLL
DU,8,ARRAY6       0.00      0.00     60.00      0.00      0.00 NO
PITCH
DU,9,ARRAY6       0.00      0.00     60.00      0.00      0.00 NO
HEADING
DU,10,ARRAY6       0.00      0.00     60.00      0.00      0.00 NO
TEMPERATURE
DC,1,SPECIAL  "FH00004" MACRO  1
CI,1,SPECIAL "Poseidon 314" CRUISE ID GOES HERE
LR,1,SPECIAL " " LORAN FILE NAME GOES HERE
```